The JOURNAL of the NATIONAL DENTAL ASSOCIATION

VOLUME VII — NUMBER TWELVE

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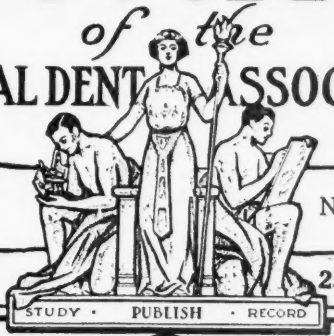

DECEMBER, 1920

Deafness as Influenced by Malposition of the Jaws—*Wright*

Teeth and Bone of the Mascalonge—*Foote*

Geometry of Mandibular Movements *Williams*

Surveying Dental Education—*Whipple*

Solving the Mouth Hygiene Problem for Chicago—*Evans*

Fiftieth Anniversary New Jersey State Dental Society—*Albray*

The Spirit of the Day "Do Good and Distribute" —*Editorial*

A Merry Christmas to You
Kindly Contribute to Christmas Seals

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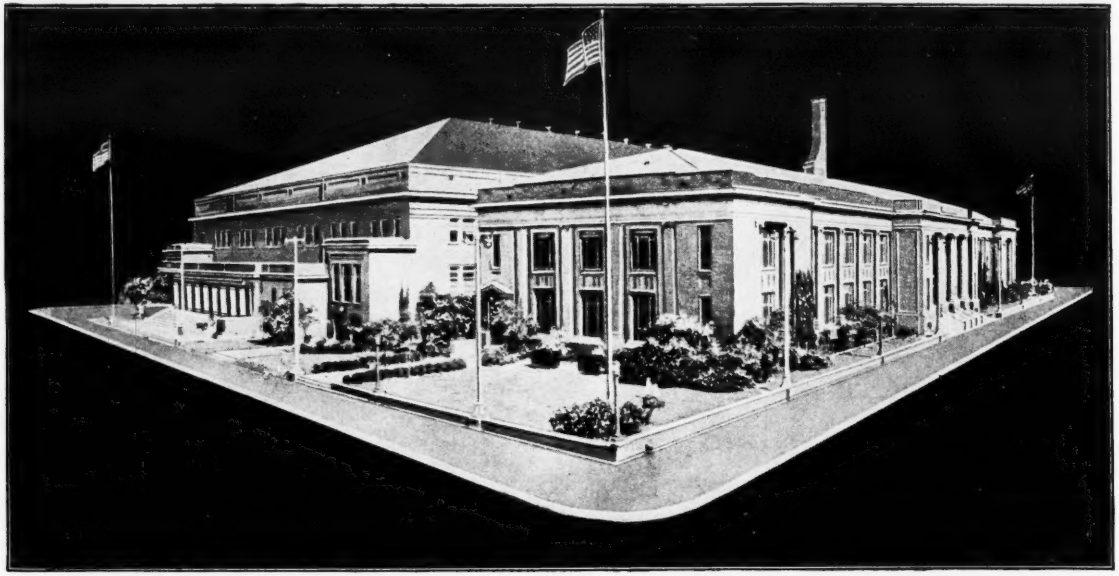

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THE JOURNAL
OF THE
National Dental Association
VOL. 7 DECEMBER, 1920 NO. 12

Original Communications.

DEAFNESS AS INFLUENCED BY MALPOSITION OF THE JAWS.

By WALTER HENRY WRIGHT, D. D. S., Pittsburgh, Pa.

(Read before the National Society of Denture Prosthetists, Boston, Mass., August 20, 1920.)

FOR the last few years the dental profession has held the attention of the combined branches of the healing art. Scientific study has led to amazing results in the form of discoveries, prevention and cures. How many more interesting and beneficial discoveries are to follow, must be decided by the future. It is true, however, that our daily routine presents many possibilities which are overlooked in the rush of pressing business.

The fact that some patients presenting for dental attention experienced more or less difficulty in hearing, has led the writer to spend some time trying to solve this phenomenon to his satisfaction. Since it is impossible to gather more than a fragment of the case history, a great deal must be taken for granted in these cases and the lacking evidence be supplied by a definite knowledge of the anatomy involved, together with an understanding of the pathologic possibilities. Ample means have been at the writer's disposal in the form of patients in the public clinics of the dental school of the University of Pittsburgh, and anatomical material in the anatomical laboratory of the same institution.

Naturally, when anticipating results beneficial to the patient it is necessary to eliminate all those who present with cases that suggest destruction of the organ of hearing either by disease or accident and confine our treatment to patients who possess abnormal relationship of the mandible with the maxillae.

This consideration has permitted a classification of the various causes which may have a more or less profound influence upon the special sense of hearing. These causes are enumerated in the following proposition:

Proposition: That in some individuals deafness, to a greater or less extent, may exist due to abnormal relationship of the mandible with the maxillae producing habitual posterior displacement of the condyles of the mandible, this condition being the result of the following causes.

First: The loss of some or all of the teeth.

Second: Malposed teeth permitting malocclusion.

Third: Extensive abrasion producing a close bite.

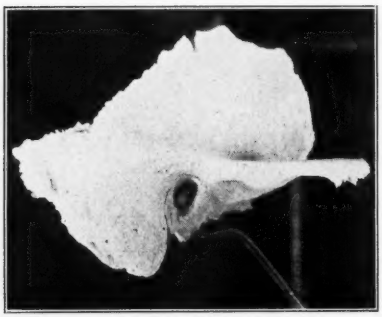
Anatomy: In order to gain a more definite idea of the etiology in these cases, it is perhaps worth while to review some of the salient points of anatomical relationship.

The temporal bone (Figures 1 and 2), which is the structure in question, offers more points for study and more difficulties in studying its many parts than any other bone of the skull. It presents an excellent example of the protection that nature provides the organs of special sense.

This bone has for study three portions: The Tympanic, Squamous and Petro-Mastoid. It is necessary, however, to discuss only the Squamous and Petrous portions.

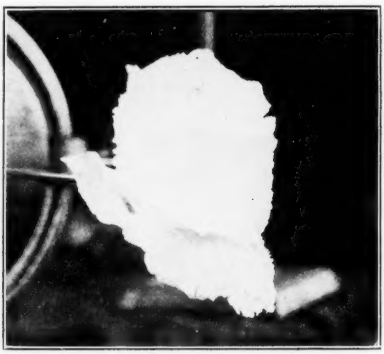
The Squamous portion is made up of two parts, the first vertical in position, shaped like a scale, forming the thin lateral wall of the brain case. The second, horizontal, forming the roof of the external auditory meatus, the glenoid fossa and a small portion of the floor of the brain case. From the lower border of the Squamous portion a strong projection passes forward, the Zygomatic process, (Figure 3.) This process unites anteriorly with the malar bone, forming the Zygomatic arch which provides one of the strongest and most important connecting links between the cranium and face. Its upper border is tapered to an edge, to which is attached the temporal fascia, while the under surface is rounded, from which arises the masseter muscle. Three processes extend from the posterior extremity of the

Figure 1.



External view of temporal bone, showing eminentia articulans, glenoid fossa, post glenoid tubercle, ext. auditory meatus, tympanic plate and mastoid process.

Figure 2.



Internal view of temporal bone, showing petrous and squamous portions.

Zygomatic arch, called the anterior, middle and posterior roots, which connect the arch to the temporal bone, (Figure

Figure 3.

Lateral view of skull showing relationship of zygomatic arch, condyle, tympanic plate and auditory meatus.

4.) The *anterior root* arises from the arch at nearly right angles and passes

Figure 4.

Enlarged view of skull in region of temporo-mandibular joint, showing zygomatic arch with anterior, middle and posterior roots; also condyle, ext. auditory canal, tympanic plate and glenoid fossa.

toward the median line with a slight posterior inclination. It is short and thick, having on its under surface, an oval shaped concavo-convex eminence called the Eminentia Articularis (tuberculum articulare) which is covered with cartilage in the recent state. This eminence forms the anterior boundary of the glenoid fossa (fossa mandibularis.)

The *middle root* is the smallest of the three, arising approximately three-fourths inch posterior to the anterior root and passes mesially only a short distance where it terminates at the glaserian fissure (petro-tympanic.) Since this root forms part of the posterior boundary of

Figure 5.

Inferior view of glenoid fossa, showing tympanic plate, glaserian fissure.

the glenoid fossa, it is called the *post glenoid process* or tubercle and helps to separate the glenoid fossa from the *external auditory meatus.*

The posterior root runs directly backward, passes above the external auditory meatus where it begins to curve upward above the mastoid portion; hence its name, supramastoid or temporal crest.

Between the anterior and posterior roots of the zygoma is the glenoid fossa. (Figure 5.) This depression is oval-shaped, extending inward and slightly backward. It is divided into two parts, the articular, mandibular or anterior part; covered in the recent state with cartilage and articulating with the condyle of the mandible. The articular

part is separated from the non-articular or posterior part by the post-glenoid process or middle root of zygoma and a long narrow slit, the glaserian or petro-tympanic fissure. This post-glenoid process, according to Humphry, is the representative of a prominent tubercle, which in some of the mammalia, descends behind the condyle of the jaw and prevents it being displaced backward during mastication, (Figure 6.)

The posterior part of the glenoid fossa is formed principally by the

Figure 6.

Lateral view of skull of man and animal, showing relative size of post glenoid tubercle and thickness of tympanic plate.

tympanic plate, which forms the anterior wall of the external auditory meatus and the tympanum, (Figure 7.)

The following structures pass near the glenoid fossa. The glaserian fissure lodges the processus gracilis of the malleus and transmits the tympanic branch of the internal maxillary artery.

The corda tympani nerve passes thru a separate canal parallel to the glaserian fissure, the canal of Hugier on the outer side of the eustachian tube. The canal for the eustachian tube passes internal to the glenoid fossa.

The tympanic portion of the temporal bone is lodged in front of the petrous portion and forms all but the roof of the external auditory meatus. The part that forms the anterior wall of the auditory canal is called the tympanic plate. This plate is extremely thin and separates the external auditory canal from the glenoid fossa, (Figure 8.) As mentioned before, the tympanic plate is separated from the articular part of the fossa by the glaserian fissure, which

Figure 7.

Vertical cross section of skull, showing relationship of tympanic plate and auditory canal.

opens into the tympanic cavity. The inferior margin of the tympanic plate is jagged and rough, forming the vaginal process, which surrounds the base of the styloid process. The internal part is thinner than the external margin, to which the cartilage of the ear is attached. This plate is inclined inward and forward while the condyle is inclined inward and backward, forming a condition which places the inner end of the condyle in some normal cases as far back as the glaserian fissure or even across this dividing line.

Cross Section.

In a horizontal cross section from before backward the following gross structures are seen: Condyle of mandible, interarticular fibrocartilage, parotid gland (part), tympanic plate, and auditory canal, (Figure 9.) The eustachian tube arises above and internal to the condyle, passing downward, inward and forward in a bony canal, the thick walls of which afford it ample protection from the inner extremity of the condyle, (Figure 10.) The typmanic membrane or ear drum lies directly posterior to the inner end of the condyle and is separated from it by the thin wall of the tympanic plate and the soft tissues enumerated previously, (Figure 11.) Cases of fractured tympanic plate due to blows upon the mandible have been reported.

Figure 8.

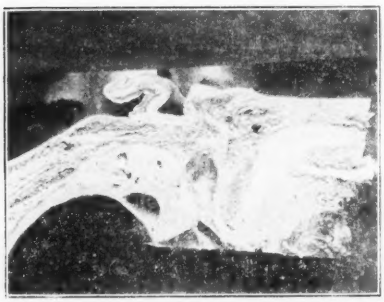
Views of lateral and horizontal cross sections of skulls, showing relationship of tympanic plate, external auditory canal and post glenoid tubercle.

Etiology.

From a study of the anatomy, it is evident that the condyle of the mandible is near the tympanic plate under normal conditions. When the posterior teeth of the mandible are lost, there is a tendency for the angle to become an obtuse angle which increases the distance from the condyles to the anterior teeth. If the anteriors remain in normal occlusion with the upper teeth, posterior displacement of the condyle must compensate for the additional length of the mandible. (Figure 12.) Similar results may attend the loss of the upper anteriors and the lower posteriors, (Figure 13.) (When the upper anteriors are lost the resorption is labio-lingually, which places the upper ridge posterior to the lower anterior teeth and the continual retrusive action of the mandible during mastication causes backward displacement of the condyles), the loss of all the upper and lower teeth, in fact any combination of losses which allows the jaws to approximate each other in what is termed a closed bite with continued effort on the part of the patient to retrude the mandible during mastication

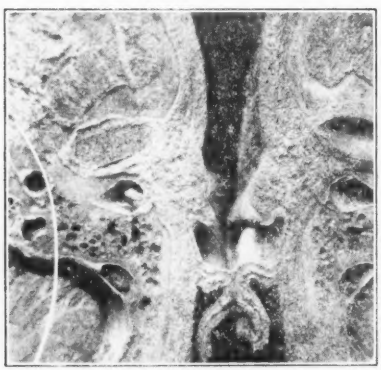
should be regarded as a possible cause of existent deafness, (Figures 14, 15, 16, 17, 18.) Abrasion and malposition of the teeth, which permit abnormal relationship of mandible and maxillae, may be also listed in the group of causes. (Figure 19, 20.)

Figure 9.



View of horizontal cross section of specimen, showing condyle of mandible, inter articular fibro cartilage, part of parotid gland and auditory canal.

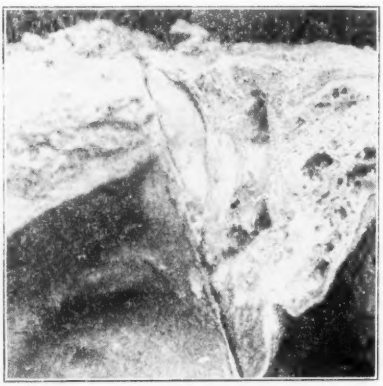
Figure 10.



Horizontal cross section of specimen, showing probe in eustachian canal on left, while canal has been opened on the right.

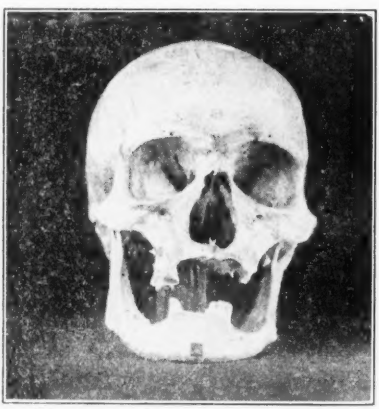
When the condyles of the mandible are habitually retruded, the pressure causes a gradual resorption, not only of the interarticular fibro-cartilage, but also of the structures surrounding the joint, which may include part of the tympanic plate opposite the point of greatest pressure, (Figures 21, 22, 23, 24.) The condyle being in relationship with the

Figure 11.



Vertical and horizontal section to show relationship of inner extremity of condyle to tympanic membrane.

Figure 12.



Skull showing loss of upper anterior teeth and lower posterior teeth.

cartilaginous portion of the canal, causes a compression of the outer meatus which may almost amount to a complete closure. This constriction of the canal together with continued pressure and

Figure 13.

Skull showing loss of upper anterior teeth and lower posterior teeth.

irritation upon the tympanic plate, to which the ear drum is attached, and possibly upon tympanic artery and corda tympani nerve, seems to cause partial or

Figure 14.

Skull showing loss of upper and retention of lower anteriors, and lower left molar. The teeth have been lost since preparation of skull.

total loss of hearing which the writer terms traumatic deafness. The fact that many individuals allow the mandible to hang open when listening seems to indicate that hearing is improved when pressure about the joint is relieved.

As previously stated, it is impossible to obtain any evidence as to the condition of the tympanic plates of the patient afflicted. The lumen of the canal is usually diminished which condition pre-

Figure 15.

Skull showing approximation of jaws after loss of teeth.

vents proper examination, while the difficulties of X-ray examination may be easily recognized.

The examination of a number of

Figure 16.

Edentulous skull, showing fairly normal relationship of the jaws.

skulls has led the writer to believe that data obtained from this source cannot be relied upon, since the number of perforated tympanic plates appear to be greatly in excess of cases of traumatic

deafness occurring in life. The examined skulls were divided into three groups:

Figure 17.

Edentulous skull, showing abnormal relationship of jaws, greatly exaggerated to show posterior displacement.

Group 1. Normal or nearly normal relationship of the jaws.

Group 2. Abnormal relationship of the jaws.

Group 3. Edentulous skulls.

Figure 18.

Edentulous skull, showing elongation of mandible and abnormal form of condyle and glenoid fossa.

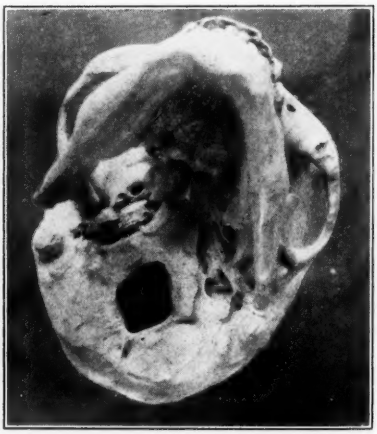
In group I, three skulls were found to contain perforated tympanic plates. One skull exhibited a rounded opening in either plate which indicated a normal, rather than a pathologic condition, (Figure 25.) One with abraded teeth showed a slight perforation on the right. In group II, nearly 50 per cent were

Figure 19.

Skull showing abrasion where perforation of tympanic plate is present.

perforated on one or both sides. In group III, over 30 per cent were perforated. This high percentage of perforations is due, no doubt, to the class of individuals which are turned over to the anatomical department, the disease

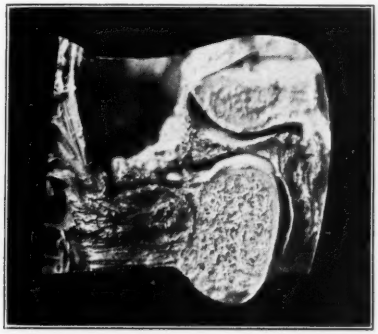
Figure 20.



Same skull as in Figure 19, showing perforation of tympanic plate internal to inner end of condyle.

of which they died, the methods of preparing the skulls and other causes; but it shows that as a rule, skulls in groups

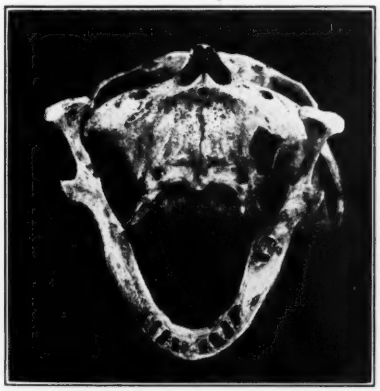
Figure 21.



View of structures about temporo-mandibular joint.

II and III have much more resorption about the tympanic plates than those of group I.

Figure 22.

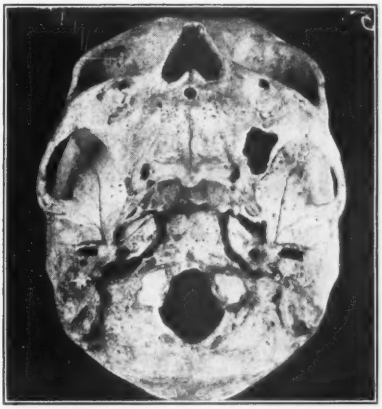


Same skull as Figure 14, showing perforation of antrum, possibly caused by pressure of lower molar.

Examination and Tests.

When a patient presents with defective hearing, it is advisable to observe the relationship of the jaws, obtain as complete history as possible including, time when teeth were lost, soreness of temporo-mandibular joint, time when

Figure 23.



Skull same as Figure 22, showing resorption of tympanic plates.

hearing began to fail, etc. (In cases of traumatic deafness, the joint usually be-

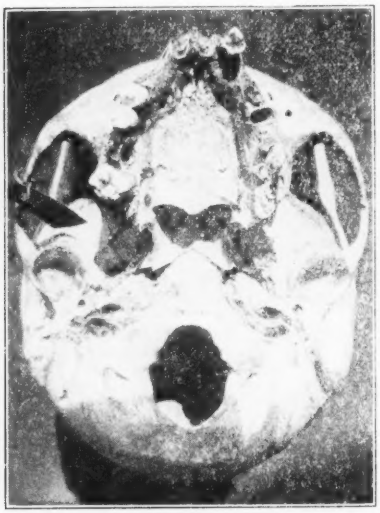
Figure 24.

Posterior aspect of condyle of mandible, showing groove to accommodate the post glenoid tubercle.

comes painful shortly after the teeth are lost, and in the course of a few months is followed by a slight impairment of

hearing which gradually becomes worse, unless the abnormal relationship of the jaws is corrected by wearing properly constructed artificial dentures.) The patient should then be sent to an ear specialist for a thoro examination. The operator may make a series of simple tests which will enable him to determine progress, (Figure 26.)

Figure 25.



View of base of skull, showing perforated tympanic plates.

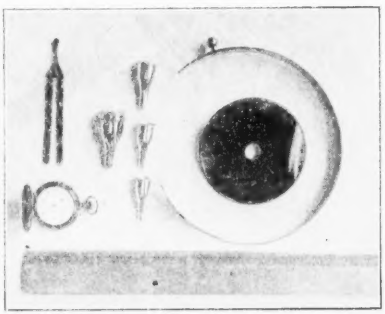
1. In a quiet room a whisper should be heard at a distance of 20 feet; to determine the relative hearing, the total distance should be used as the common denominator and the lesser distance the numerator—15/20.

2. A watch that has been tested on normal hearing may be used, altho it is not as satisfactory on account of the variation in loudness. A normal ear can detect the tick of a watch at about 40 inches and the hearing capacity is determined as in the whisper test.

3. A tuning fork of the middle register is the best instrument with which to conduct such tests, because it enables the operator to not only determine the quantity of hearing, but also to localize, to some extent, the source of the lesion. By holding a vibrating fork one to two inches from the normal ear, the quantity of hearing may be determined in seconds. Abnormal hearing is computed as in the above tests.

These tests are called air conduction tests and are supplemented by the following bone conduction tests which help to localize the lesion.

Figure 26.



Paraphernalia used in tests—head mirror, aural speculum, tuning fork, watch, measuring rule.

Place the vibrating fork on the mastoid process. If hearing is normal, it should be heard one-half the time of air conduction. Set the fork in vibration in the mid-line of the skull; it will be heard alike on both sides if hearing is normal. If one or both ears are defective, it will be referred to the worst ear.

The loss of air conduction and the retention of normal bone conduction indicate interference with transmission of sound waves caused by obstruction of the auditory canal, disease of the tympanic membrane, the middle ear or ossicles.

The loss of bone conduction is the result of impaired perception of sound, caused by disease of the auditory nerve or internal ear.

Traumatic deafness is caused by defective transmission of sound.

CASES.

Mrs. A., age 28, having lost her posterior teeth several years ago, complained lately of severe pains in the region of the temporo-mandibular joint, accompanied by a gradual impairment of hearing. The lower anterior teeth touched the gingivae about the lingual of the upper teeth. A lingual bar denture was inserted below and a bridge made to replace the upper left bicuspids. Three days later the patient reported that the soreness had disappeared and the hearing returned to normal. A week later the patient's mouth became too inflamed to wear the denture and upon the removal of the denture, soreness and deafness returned. Three days later the denture was again inserted and since that time the patient has not had a return of the trouble, (Figure 27.)

Figure 27.

Casts of Mrs. A's case, before and after lower lingual bar denture was inserted.

Mr. B., age 66, lost upper teeth, except third molars, fifteen years ago and three years ago lost third molars. The upper process was restored, except at the tuberosities, which condition made it difficult to construct an artificial denture. Eighteen months ago the patient noticed that hearing on the left side was impaired, and gradually became worse, until at present he could not hear a watch tick unless it were held against his ear. An upper denture was constructed to open the bite. After fourteen days he could hear the same watch tick at a distance of thirteen inches. When last heard from, the condition was still improving, (Figure 28.)

Mr. C., age 59, lost upper molars 24 years ago. Two years ago had remaining uppers extracted and denture inserted. Soon after this, all the lower teeth were extracted and for two years he masticated his food on the lower gums, priding himself that he could master an ear of corn without a lower denture. About 6 months after the lower teeth were lost, he noticed an aching about the temporo-mandibular joint together with an impairment of hearing. The better he became accustomed to masticating on the lower gums the worse his hearing was afflicted. Lately deafness of his left ear had caused great alarm since it meant the loss of his position. Tests were made and a lower denture inserted. After 6 weeks the deafness had not only failed to become

Figure 28.

Cast of Mr. B's case.

more severe, but showed a twenty-five per cent increase in air conduction, (Figure 29.)

In conclusion, the writer believes that nearly every community has some individuals whose hearing could be improved by the insertion of scientifically constructed dentures and feels that one grateful patient is enough to repay for any diligence or labor required in recognizing and correcting this affliction.

Figure 29.

Cast of Mr. C's Case.

DISCUSSION.

M. M. House: The men who have been carrying on work in this line are not commonly known to me. I have known Dr. Monson's work and I know that he has been doing a great deal of work along this line. He has been carrying it on with great scientific procedure and getting satisfactory results. I would like to hear from him.

Geo. H. Monson: I could only say that I appreciate Dr. Wright's work on this line. Dr. House said it was not a part of the work of the Geometry Committee. It has led up to the work of determining geometric forms. I don't know how much geometry is going to help us in determining osseous structure. In early life the meatus is more at right angles to the sagittal plane; as time goes on, it becomes more oblique; and, as abrasion of teeth is more marked and the anterior leg of the pyramid, which by the way, is a section of a sphere, is shortened, it throws the muscular balance backward. This is true, as Dr. Wright pointed out, in dentures, and will continue while the anterior leg of the pyramid is shorter than the condyle dimensions.

I was much interested to see the results (which Dr. Wright has attained,) as if they were tabulated from my records, and I appreciate his work in this line.

M. M. House: I knew that Dr. Monson had been taking slides from the rear and knew that I could get him drawn out by starting him on circles and curves.

Alfred Gysi: I have to say that is a quite new subject to me and in Europe I have never heard of such things, and I am glad that I can bring back to Europe something that I have learned in your society.

Rupert E. Hall: I would like to ask Dr. Wright and Dr. Monson what per cent of deafness they associate with this condition; do they consider that all deafness is caused in part by condyle intrusion? In other words, would a person with the condyle unchanged go thru life without any impairment of hearing?

Geo. H. Monson: A simple method which I mentioned in my paper last year, by which you can determine condyle intrusion upon the auditory meatus, is to place the ends of the little fingers on the ends of the condyle and the thumbs on the forehead. Ask the patient to open, and when they open, you will feel a release, and when they close, you will feel that the condyle will go up to a certain point and then there is a backward thrust just like when in opening you throw the mandible forward. It is a total coordinative action of the muscles, when the mandible is off its balance and back. I mention this because it is so easy to make this diagnosis, and a further check is the photograph

and the relative dimensions, which are lost by abrasion (or lost by the absence of teeth) either in bridge-work or in natural abrasions. The canal becomes elliptical. As the doctor has shown here, there is a bending back of the anterior wall. In the extreme cases, when the fingers are placed in the ear, the patient will wince when the impingement comes. Now to locate the amount with the natural teeth that the mandible have to close with a normal balance position—if you take sheets of gutta-percha and add a sheet to each until reduction is completely made, you will about determine where the point of intrusion starts. I have had a number of cases, some 30 odd, and in all but one, there is a marked improvement, but they all showed evidence of condyle intrusion by the digital examination. I have one case, in fact, which has been in the hospital for some time where the auditory meatus is totally closed on both sides, and she has lost her hearing completely. When she opens her jaws you can see the condyles move forward.

R. R. Gillis: Since Dr. Monson called our attention to deafness as caused by intrusion of the condyle into the auditory meatus at New Orleans last year, I have been on the lookout for this condition among my patients. During the past 6 months, I have had two cases which may be interesting to report.

The first is an old lady of 82, whom I have treated for 17 years. We have probably built more dentures for her than for any other five patients for each time she visits us, I try out any new things that I may have learned in the meantime.

She has worn a full upper denture for over 50 years; she lost her last lower teeth about 4 years ago and has not worn a lower denture because of irritation over some infected areas that was not entirely relieved when that denture was made. The result you may imagine; her mandible closes way too far; her condyles crowd into the auditory meatus; she has grown progressively deafer during these four years so that upon arriving for this last visit, she could not hear anything in her right ear and only loud noises in the left.

I explained this theory as to the cause of her deafness.

She was keen for relief. We built the dentures so as to re-establish central occlusion.

In three days, a happy surprise came when she informed us that she could hear every word of our conversation around the table and in 10 days she could hear a whisper in either ear.

The second case had gone without a lower denture for 12 years. This lady was showing some improvement after wearing the dentures over a month (when she went away on a visit) but she exhibited no such sensational recovery as the first patient.

I believe we should not expect like results in all cases. The age of the patient, the length of time this traumatic functioning has been existing, the general physical condition of the patient, any co-existing catarrhal tendencies, all have to be considered in our prognosis.

I wish to take this opportunity for thanking Dr. Monson for his having called my attention to this cause of deafness and its remedy; and I wish to thank Dr. Wright for his splendid exposition of the subject here.

Walter H. Wright (closing): It is really gratifying to hear Dr. Monson say the things he did about this work, because if there is anything in the world that makes one happy, it is to find somebody working on the same thing verifying a few things you have discovered. It helped me especially to know what he said about detecting this posterior dislocation. We know that a person will open the mouth when listening intently to loud sounds and a person who is hard

of hearing will do the same when listening to normal sounds. We know he does that to relieve the pressure.

I want to thank Dr. Gysi, but I hardly know what to say. If something new that had been worked out in this country could be taken to Europe and utilized there, I am sure that it would give Dr. Gysi the same pleasure that we, in this country, have felt in utilizing the contributions that Dr. Gysi has worked out over there. So I am glad that Dr. Gysi is here to hear this paper.

To Dr. Hall's question, What degree of deafness?—Will you state that again, Dr. Hall? (Dr. Hall: Do you attribute all deafness or what degree of deafness do you necessarily associate with condyle intrusion?) Answering: No, condyle intrusion does not accompany ordinary deafness. Ordinary deafness would not be accompanied by condyle intrusion and would be associated only with cases where we had reason to believe that malposition of the jaws might have something to do with the relationship of the condyles to the tympanic plate.

When I prepared the paper, I said in working out these cases that it was necessary before we began any work in constructing artificial dentures to discover whether our patient had an accident to or a disease of the ear in order to exclude the possibility of backward displacement of the condyle, but in any case where we have backward displacement of the jaws, then I would suspect this as being the cause of the deafness.

It is better for us to suspect malposition of the jaws as being the cause of existing deafness and if possible to correct this condition than to allow the patient to become deaf thru our neglect.

Then Dr. Gillis in reporting his case has had the same experience as I have. In some cases the return of hearing is rapid, and in some cases it is so marked that they approach nearly normal hearing. In other cases the improvement is slight. It is gratifying to know that some one else has done work along this line.

In closing the discussion, I want to thank this organization for listening to this paper which I thought would be exceedingly dry and uninteresting, because in order to get a definite idea of the result you must go back to the anatomical construction and try to glean what knowledge we can from that source, and in view of the fact that so much interest has been shown, I am sure that the time I have spent in working it out has not been in vain.

Dr. M. M. House: On behalf of our society I wish to extend to Dr. Wright our hearty appreciation and our thanks for this masterpiece which is so well gotten up and well presented.

THE TEETH AND BONE OF THE MASCALONGE*—ESOX—OF WISCONSIN WATERS.

By J. S. FOOTE, A. B., M. D.
Professor Pathology, Creighton Medical College, Omaha, Nebraska.

(This paper was given before the Odontological Society of Omaha, Sept. 16, 1920.)

THE gross and microscopic characters of the teeth, the microscopic structure of the circulation in bone have been studied in the mandible and cranial bones of a mascalonge, weighing 25 pounds, caught in Lake Barker, Wisconsin.

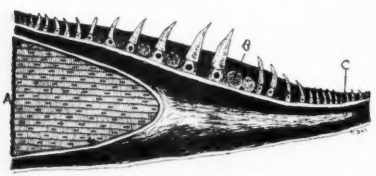
Gross Characters of the Teeth: The teeth of the lower jaw—twenty-eight in number—are arranged in a single row along the upper border of the jaw bone and are curved inwards. In the anterior and posterior portions, they are small, while in the middle portion they are long and widely separated, Figure 1. They are all sharp-pointed teeth, varying in length from 2 mm in the anterior to 15 mm in the middle portions, and are firmly ankylosed to the bone. Between the teeth may be seen the sites of the shed teeth, Figure 1-B. A large muscle occupying the central canal of the jaw bone is seen at A. The teeth are prehensile, destructive of prey, and are teeth by appearance and situation rather than by definition. In addition to the teeth of the lower jaw, there are a large number of small, curved, sharp pointed teeth on the lingual bone, situated in the floor of the mouth. This bone separates into two diverging branches at its posterior extremity and these branches are thickly set with teeth curving inwards and backwards. Between these branches and the anterior extremity of the bone are four isolated patches of teeth. The teeth of the lower jaw are shed, at least once, and the new teeth are established by the sides of the old ones in the following manner: A loose vascular membrane is attached to the inner and upper surfaces of the jaw bone, and is perforated by the old teeth, Figure 2-D. This is a tooth forming membrane—the jaw bone taking no part in the formation of the teeth. It is composed of an inner and outer layer enclosing a trough-like cavity, Figure 2-E.

Fibrous, vascular buds, Figure 2-A, or extensions arising from the inner layer produce new flattened, cone-shaped, hollow teeth which remain firmly attached to these extensions, Figure 2-B. Slitting open the membrane lengthwise, the new, white teeth may be seen lying flatwise in the bottom of the cavity, as at Figure 2-B. Gradual transformation of the connective tissue extensions by an ossifying process, from their distal ends, Figure 2-K, brings the new teeth to a vertical position by the sides of the old teeth. These new teeth become the shafts of the second teeth, Figures 2-C, 3. The fibrous extensions being transformed into osteo-dentin or some inorganic compound, are then ankylosed to the jaw bone and become the bases of the second teeth, Figures 2-F. 3. The blood vessels of the fibrous extensions become enclosed as the osteo-dentin is formed and remain as the blood vessels of the

*This investigation was suggested by the histological variations found in bone during the writer's study of microscopic sections of the femora and other bones of various animals from amphibian to and including man, and published in the Smithsonian contributions to knowledge series Vol. 35, No. 3, 1916.

second teeth. Following the ankylosis of the new teeth—which have pierced the outer layer of the teeth-forming membrane—the shafts of the old teeth separate from their bases, which then degenerate, become granular and wear away down below the surface of the jaw bone, where they may be seen as concave,

Figure 1.

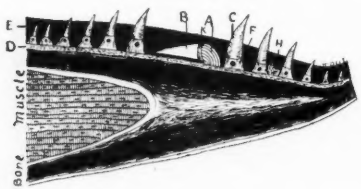


Portion of lower jaw showing ankylosed teeth. Striped muscle, A; sites of shed teeth, B.

granular depressions, Figure 1-B, 2-H. This is the shedding of the old teeth.

Thus, there are three processes involved in the production of the second teeth, viz., (1) the formation of the shafts on the tips of the connective tissue extensions; (2) the transformation of these extensions into inorganic substance

Figure 2.

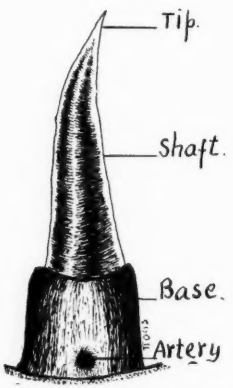


Formation of a new ankylosed tooth of lower jaw, A, fibrous extension; B, tooth.

and their fixation—by ankylosis—to the jaw bone; and (3) the shedding of the old teeth. In the production of these—the earliest teeth in tooth history among vertebrates—the three essentially different processes which are involved, bear some resemblance to those processes in operation in the production of the second teeth of man. In the production of human teeth there is (1) a downward dip of the oral epidermal epithelium, (2) an upward extension of the connective tissue of the jaw—called the papilla. (The epithelial layer is applied—cap like—to the papilla and becomes the enamel, while the papilla gives rise to the dentin,) and (3) the shedding of the old teeth. Thus the shedding of the teeth among vertebrates began in the fish.

Structure of a New Tooth: Figure 4 is a cross section of a new tooth of the lower jaw before the base is formed and

Figure 3.

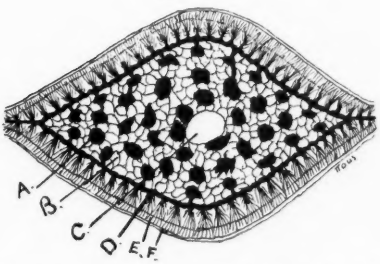


Ankylosed tooth of the lower jaw.

ankylosis has occurred. The central body of the tooth is composed of a perfectly clear white substance—called by some, vaso-dentin—traversed longitudinally by many vascular canals, Figure 4-A. Very minute branches are sent off from these canals in all directions dividing the vaso-dentin substance into small cell-like looking bodies, Figure 4-B. There is a central cone-shaped canal occupied by the vascular extensions from which the new tooth originated, Figure 4-C. The canal gradually disappears from the apex toward the base as the vaso-dentin substance is formed. Around the border of the body of the tooth is a large vessel which sends off numerous straight, small

branches toward the external boundary of the section, Figure 4-D. At this stage of development there is no indication of enamel. A slightly yellowish layer is seen around the outer portion of the body, but cannot be distinguished from it by any line of demarkation, Figure 4-E. The line shown in the diagram merely indicates the position of this enamel-like layer. The small vascular branches from the peripheral vessel extend to the outer border of the enamel-like layer, but disappear as differentation advances. Around the enamel layer is a thin, structureless,

Figure 4.

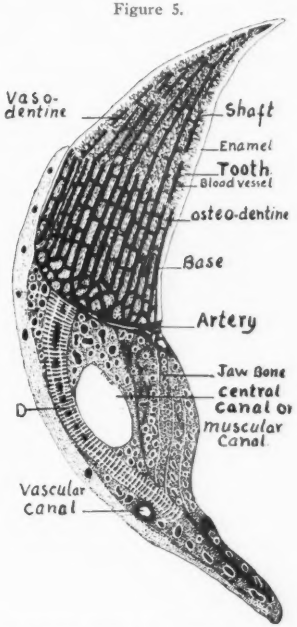


Cross section of a new tooth of lower jaw of a mascalonge before it was ankylosed to the bone.

colorless membrane-like enclosure, Figure 4-F.

Structure of an Ankylosed Tooth of the Lower Jaw: In Figure 5 is shown a section taken from the middle portion of the left half of the lower jaw and is a cross section of the jaw bone and a longitudinal section of a tooth in its natural position. A line drawn thru the middle of the section from the tip of the tooth to the lower border of the bone is an arc of a circle having a diameter of 30 mm. The length of this line is 32 mm.—the tooth having a length of 15 mm. and the jaw bone a width of 17 mm.—that is—the tooth is about equal in length to the width of the jaw bone. The anterior portion of the jaw bone is an arc of a circle with a diameter of 240 mm. In the center of the jaw bone is a large canal extending lengthwise and diminishes in its diameters as it passes forward. This canal contains a large striped muscle, which—with its companion—moves the jaw with great force—and is found inside the bone instead of outside, Figures 1-A, 2, 5. The circular characters of the jaw bone, as seen in its two measurements, gives a

Figure 5.



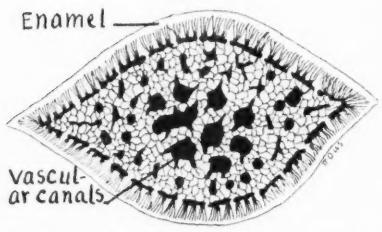
Cross section of the lower jaw of a mascalonge with ankylosed tooth in position.

mechanical value of great importance to the musclar force applied whenever contraction occurs. Beneath the muscular canal is a smaller vascular canal, Figure 5. The tooth is a stout, cone shaped, curved tooth with a sharp tip, a glistening, tapering shaft and a dull bone-like base, having a thickness equal to that of the jaw bone to which it is firmly ankylosed, Figure 5. The tooth is butressed on the outside by a wall of bone extending upward from the jaw. Just above the lower border of the base of the tooth,

and midway between the lateral boundaries of the base is a round hole 1 mm. in diameter, which is the site of the entering blood vessel on its way from the tooth, forming membrane to the tooth, Figures 5, 3, that is, the ankylosed tooth receives its blood supply from the oral membrane and not from the jaw bone. This may be seen in Figure 5, where there is no vascular connection between the tooth and the bone.

Structure of the Shaft and the Tip: The shaft of the ankylosed teeth—as seen in cross section Figure 6—differs considerably in structure from that of the new tooth described under Figure 4.

Figure 6.



Cross section of ankylosed tooth of the lower jaw.

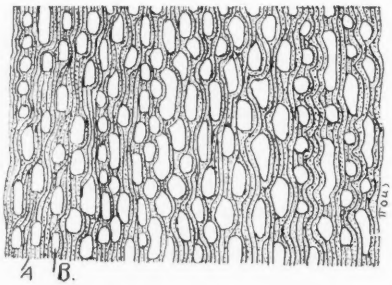
The shaft of the ankylosed tooth is the new tooth under completed differentiation. The points of difference are the following: The new tooth has a central canal, vessels extending to outside border of the enamel-like envelope, and an enclosing membrane-like covering. The ankylosed tooth has no central canal, has enamel-like envelope without vessels and is without a special enclosing membrane, Figure 6.

Enamel: The external glistening envelope is called enamel, more on account of its situation and color than on account of its structure. It seems to be merely a modification of the vaso-dentin substance and derived from the same source, Figures 4, 5.

The tip of the tooth is sharp, circular or knife blade in shape and composed entirely of the enamel substance, Figures 4, 5.

Structure of the Base of the Tooth: Figure 7 is a longitudinal section of the base of an ankylosed tooth. It is composed of parallel, longitudinal, ossified connective tissue fibers or rods, enclosing many vascular canals, containing blood vessels, Figure 7-A-B. There is a small amount of the base, (1 mm) below the entering vascular canal. The artery, after passing into the base, divides into a vertical plexus, which embraces the ossified rods and extends outwards into the shaft. At the junction of the base and jaw bone are found several vascular canals in cross section.

Figure 7.



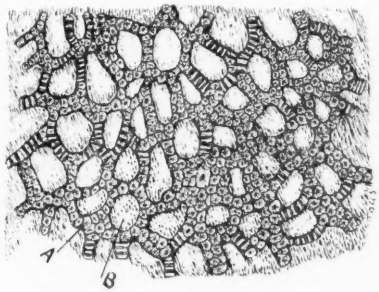
Longitudinal section of base of tooth of lower jaw. A, ossified rods; B, vascular canals.

Cross Section of the Base: Figure 8 is a cross section of the base. It is composed of cross sections of the ossified rods—seen in the longitudinal section—arranged in the form of a framework enclosing the vascular canals. The rods are round or angular in shape. Some of them are cut obliquely and appear as striated bodies. In a cross section of a rod there is seen a center and lines radiating from it in all directions.

The Teeth of the Upper Jaw: These teeth,—1000 or more—are small and large, sharp pointed, curved or straight, and are arranged in rows on the two palatine bones and central vomer. Directly above the teeth of the diverging branches of the lingual bone is a large area of small teeth occupying the central portion of the roof of the mouth. These

teeth are also curved backwards. They remind one of the filiform papillae of the tongue (ossified) which are seen in herbivorous animals. The teeth along the inner borders of the palatine bones are larger and longer than those along the outer borders; while the teeth of the central vomer are large in front and decrease markedly in size as they extend backwards. The teeth of the palatine bones are curved inwards and backwards, while those of the vomer curve backwards. On the anterior portion of these bones and near the entrance to the mouth are 6 or 8 large, straight, sharp pointed teeth. The small teeth are hinged and the large, ankylosed.

Figure 8.



Cross section of the base of an ankylosed tooth of the mascalonge. A, ossified rods; B, vascular canals.

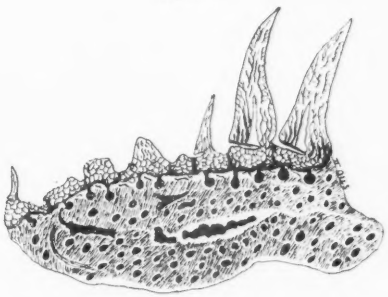
Besides these, there is a row of very small curved teeth along the outer lip of the upper jaw, and a patch of small curved teeth—25 mm long and 12 mm wide—on the lingual bone. Such an extensive tooth array as this provides a most formidable prehensile character to the mouth of the fish. Figure 9 is a cross section of the vomer, showing the hinged teeth and the circulation underneath. The hinged and ankylosed teeth differ very materially in their methods of blood supply. In the hinged teeth the blood supply is derived from the jaw bone, in the ankylosed from the oral membrane.

Figure 10 shows a hinged tooth and an ankylosed tooth drawn on a larger scale than that in Figure 9, for the purpose of comparison. The hinged* tooth is seen at A, and the ankylosed at B. The interesting differences between the two teeth are to be found in the plan of circulation and in the pulp rather than in structure.

In Figure 10-A is seen the circulation in the form of a dense plexus of blood vessels situated in the bone, directly underneath the tooth and derived from the jaw bone.

In the ankylosed tooth (Figure 10-B) the circulation is seen to be in the tooth and is independent of the jaw bone.

Figure 9.



Cross section of vomer of a mascalonge, showing hinged teeth and the circulation underneath.

Figure 11 is a drawing of a plexus of blood vessels as it was seen in a cross section of a palatine bone. The plexus was underneath a hinged tooth.

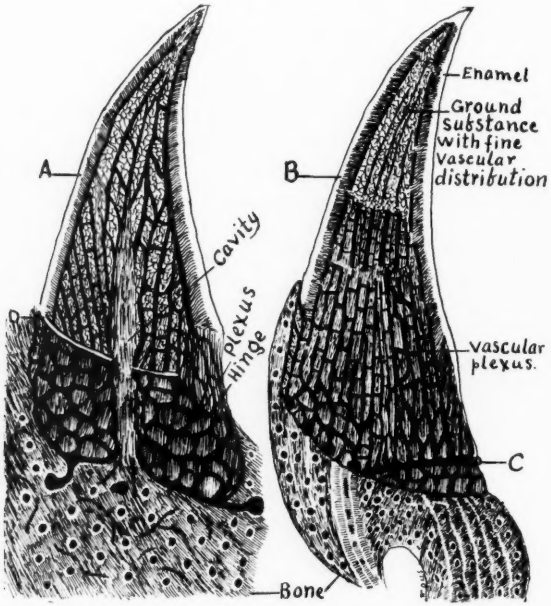
On account of the hinged feature and dense circulatory plexus, the hinged tooth is more highly organized than the ankylosed and consequently the formation of new, and shedding of the old teeth, would involve complex embryological differentiations not adapted to the situation. A hinged tooth has a cone-shaped pulp, while the ankylosed has not, Figure 10. By tipping the hinged tooth laterally a small central core or pulp

*For a description of hinged teeth, see Tome's Dental Anatomy, 7th Ed.

may be pulled out, leaving a cone-shaped cavity. Figure 12 is a cross section of a hinged tooth. Comparing this with Figure 6, which is a cross section of an ankylosed tooth, the marked increase in the number of vascular canals is obvious, as well as the variations in the character of the pulp.

the tooth of man, there are some points of resemblance in their methods of formation and in their structure. They are millions of years apart historically and the resemblance is more of the nature of a common force calling out of undifferentiated bone substance the differentiated forms of a definite and

Figure 10.



Hinged tooth (A) of the vomer, and ankylosed tooth (B) of the lower jaw of the mascalonge.

It is not easy to understand why the teeth of this fish require such an extensive blood supply. They are organs of capture and not of mastication, and are called teeth more from their location than from their function. The mascalonge* captures a variety of living animals.

Comparing the tooth of the fish with

*These who have caught these fish have found the following animals in their stomachs at different times: Wood duck, rice birds, garter snake, black bass, minnows, cray fish, frogs, sucker or "red horse," wall eyed pike.

permanent value in the various functions which the teeth will possess.

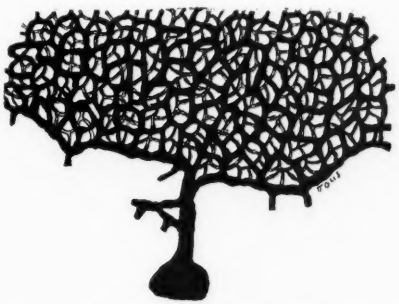
In the tooth formation of the fish there are: 1, Shaft, 2, Base, (Enamel, Vasodentin, Osteo-dentin); 3, Ankylosis; 4, Shedding of old teeth.

In the tooth formation of man, there are: 1, Enamel; 2, Dentin and pulp; 3, Cementum; 4, Shedding of teeth.

Bone: From an extended study of over 1000 sections of the femora and other bones of different animals, from

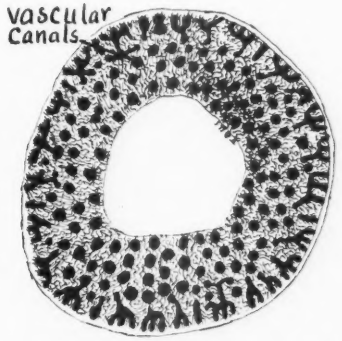
amphibian to man (inclusive) it has been determined, by the writer, that bone is not uniform in structure, but varies in structural type in the various classes, species, individuals and in the grade of development of the individual. Even kittens of the same litter may not have the same bone structure. There are three structural bone units which—singly or in combination—enter into the construction of bone, viz: the lamella, lamina and Haversian System, Figure 12½. Some

Figure 11.



Circulation beneath the teeth of the palatine bone of the mascalonge, as seen in a cross section.

Figure 12.



Cross section of a hinged tooth of the palatine bone of a mascalonge.

units extend from the amphibian, thru the reptile, bird and mammal into Man, as the lamellae and early differentiations of the Haversian System; some, from the reptile to man, as the laminae and some from the late mammals-ungulates, into man, as the late differentiations of the Haversian System; that is, lamellae, laminae, and Haversian Systems did not all appear in an equal degree of differentiation at the same time in vertebrate history, but at different times, and in the order above mentioned. The most completely differentiated unit is the Haversian System and this is found as the sole unit of structure in only a few mammals and in some men,—but not in all.

Variation in bone structure is the rule and not the exception, and occurs most extensively in the mammals. It is generally true that the lower the grade of development of the animal, the lower the type of bone structure will be, and conversely the higher* the grade, the higher the bone type. We do not find an amphibian bone composed of completely differentiated Haversian Systems, and do not find human bone composed of lamellae alone; but the lamella characterizes the amphibian and the Haversian System, man. It seems to be a fact that those aimals possessed of the highest degree of intelligence have the highest type bone and those with the lowest degree have the lowest type bone. Taking the degree of intelligence as the basis of valuation, we would expect to find a low bone type in the fish and in this we are not disappointed.

As the fish is the earliest vertebrate which has bone, it is interesting to compare its bone type with that which is found in the amphibian (next in order above) and the higher animals.

The bone structure of the mascalonge

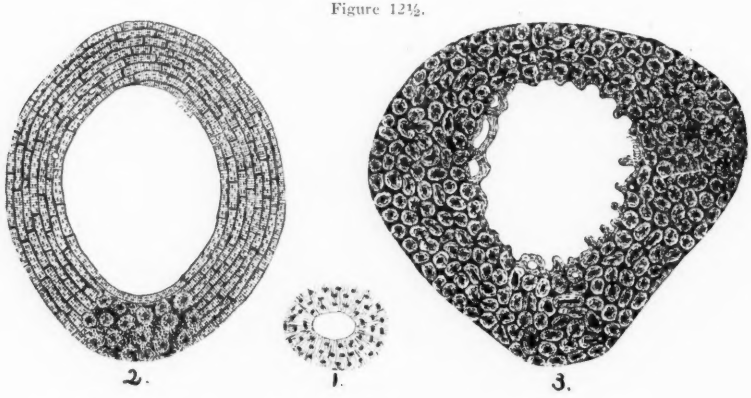
*The terms lower and higher grade of animal, refer more especially to cerebral than to physical levels and low and high bone type, to the earliest unit—lamella and the latest—Haversian System.

presents some interesting peculiarities.* In bone construction the visible result is evidence of an operating force which produced it. The peculiarities of bone type of the fish are seen (1) in the differentiation of bone substance leading to a constructive unit, (2) in the plan of the circulation and (3) in the relation of one to the other.

Referring to Figure 5 again, a cross section of the lower jaw bone with a tooth in position may be seen. The differentiation of bone substance in this section presents an earlier or lower degree than that seen in the amphibian. The bone substance is lamellated, but the lacunae and canaliculi which are present in the amphibian are not found in the bone of the fish. In this bone, minute objects are seen in the bone substance which appear—at first sight—to be lacunae, but which on further investigation are found to be short segments of minute vessels.

No canaliculi extending from one lacuna to another have been found in any of these sections as in amphibian and later bone sections, and therefore, no lacunae with their osteoblasts are possible, unless the short segments of the minute vessels, referred to above, are earlier forms of lacunae than those seen in the amphibian and the endothelial cells of the vessels are early forms of osteoblasts. Extending in a curved direction from about the middle of the base of the tooth, around the central, muscular canal, to the lower border of the jaw bone, are 4 or 5 curved, cross striated strands arranged closely together, Figure 5-D. These strands resemble the bone differentiations seen in some amphibians and reptiles. One of these strands, usually the middle one, has several perforations which seem to lead into a hollow center of a tube, but in cross section of the strand, no tube is evident. This striated structure is quite distinct from the rest of the bone and is always present as a considerable number of sections show. With the high power objective the cross striations are seen to be single or branched slits or clefts in the bone substance and extending between them are extremely minute parallel

Figure 12½.



Second type Bone, Laminae-Eland. First type bone, Lamallae-Frog. Third type bone, Haversian System—Man.

The three types of bone.

*In a monograph entitled "The Comparative Histology of the Femur" referred to in a former foot note, the comparative histology of bone was considered from amphibian to and including man and in this connection the bone of the fish, which antedated historically the amphibian, becomes interesting by way of comparison.

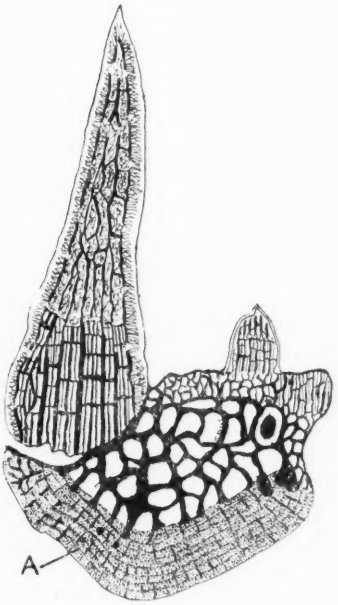
slits or clefts. The clefts are believed to be circulatory channels forming an early plan of circulation and one that extends into some of the later animals—as the amphibians, reptiles and some mammals. Segmenting the striations with their minute communicating clefts would form the lacunae and canaliculi of later differentiations. Figure 13 is a cross section of a palatine bone with an ankylosed tooth in position. In this section, the bone exhibits a differentiation similar to that seen in the strands of Figure 5-D. This may be seen around the external border of the section where there are 8 or 10 strands partly or completely crossed by vascular clefts, Figure 13-A. This has also been observed in Testudo sophyrus—a reptile.

In Figure 14 is shown a cross section of the right half of the lower jaw thru the fourth small tooth from the front. Figure 1-C.

In this section, while the differentiation of bone is early, the plan of architecture is a finished plan.

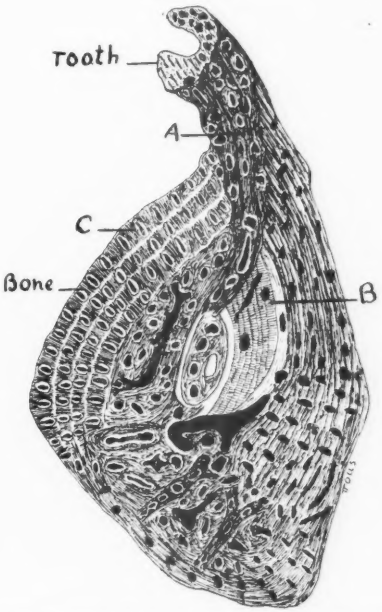
It preceded and devised structural units to work out its needs as more and more complex functions arose. In the upper half of the sections, is seen a cone-shaped vascular bone structure terminating above in the small tooth, below near the central canal, and is distinctly separated from the rest of the bone, Figure 14-A. The strands, mentioned above, are seen at the right of the small central canal, Figure 14-B. A great many vascular canals equivalent to the earliest form of Haversian Systems are seen in various parts of the section. These canals are found in the bone of all classes of animals, including man.

Figure 13.



Cross section of right palatine bone, with tooth in position, of mascalonge.

Figure 14.

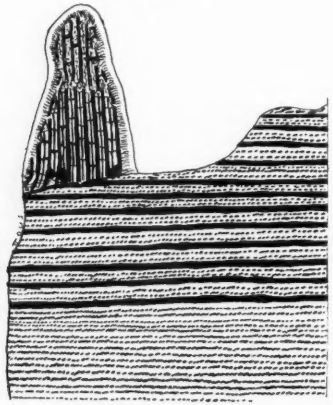


Cross section of right lower mandible of the mascalonge, section being made thru the fourth small tooth from the tip.

They are surrounded by clear areas of bone substance and their great number indicates a very vascular condition in bone, Figure 14-C. The architecture of this section is very complicated and defeats an explanation when the position of the bone and its purposes are taken into consideration. The bone substance is lamellated and non-lamellated, but no lacunae or canaliculi are recognizable.

Circulation: In Figure 15 is seen a tangential section of the lower jaw, showing the circulation. The vessels are of different diameters and are parallel with each other. They extend lengthwise of the bone and are practically independent of the teeth. Between the blood vessels and along the lower side is seen the lamellated bone without lacunae or canaliculi.

Figure 15.



Tangential section of the lower jaw and tooth of a mascalonge.

Figure 16.

Cross section of lower jaw of mascalonge, showing lamellated bone without lacunae or canaliculi.

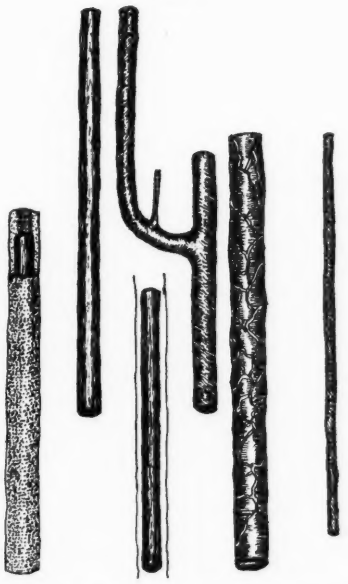
In Figure 16 is seen a small portion of a cross section of the lower jaw. The bone substance is differentiated into lamellae. There is no visible evidence of lacunae or canaliculi. The lamellae are composed of a clear, homogeneous bone substance and are made distinctly visible under the microscope by the granular cement substance which holds them together. That these are distinct units is shown by the fact in senile conditions, the changes that are found occur in one lamella after another. The lamella, the first differentiation of bone substance, is found to extend thru all classes of animals from the fish into man, and is therefore fundamental. The interpretation which it has in one class remains in all classes, as long as the lamella remains the same. This occurrence in the fish makes it one of the oldest units of construction in bone history.

Figure 17 shows some of these vessels. Their connective tissue coats have a circular or spiral arrangement which gives a physical value to the blood stream. Some are very small, others large. Here and there one is seen to branch. Around the outside of one of them is seen a vine-like clinging distribution of a nerve plexus.

In Figure 18 is seen a tangential section of a cranial suture and adjacent bone. The structure of the cranial bones differs somewhat from that of the lower jaw bone. It does not have the same complicated architecture. The bone sub-

stance is a clear white homogeneous substance—not lamellated—in which are numerous minute objects arranged in rows radiating from the suture. Some of them resemble short segments of minute blood vessels and others cross sections of capillaries or channels which are made to appear crescentic by a dark, thick wall

Figure 17.



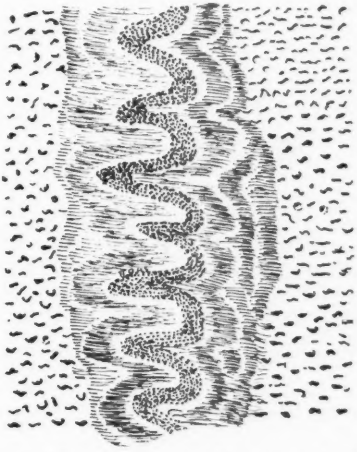
Blood vessels in a tangential section of lower jaw of a mascalonge.

on one side and a thin, almost invisible wall on the other. They have no canaliculi, do not in any way resemble the lacunae of the later bone and seem to be segments of minute vessels. It is obvious that without canaliculi they could not contain bone cells. From the suture, minute clefts or channels radiate into the adjacent bone substance and these small objects are isolated segments of these channels.

Relation of the Circulation to Bone Differentiation.

Comparing the bone of the fish—the earliest in bone history—with the bone of the amphibian and later animals, the most important difference between them is to be found in the relation of the circulation to bone differentiation. In the bone of the fish there are found no lacunae or canaliculi and bone substance, homogeneous or lamellated, is

Figure 18.



Tangential section of a cranial suture and adjacent bone of a mascalonge.

produced by the blood vessels. In the amphibians and the later animals, lacunae with their canaliculi, are always present and the special bone cells or osteoblasts which occupy the lacunae, produce bone substance. In the amphibian and later bone there is a flow of blood plasma from the blood vessels thru canaliculi to the lacunae containing bone-forming cells and also thru canaliculi from one lacuna to another—the whole system forming a complete circulation, while in the fish bone the circulation is confined to the vessels and to clefts or channels in the bone substance.

GEOMETRY OF MANDIBULAR MOVEMENTS.

By J. LEON WILLIAMS, D. D. S., L. D. S., New York City.

(Read before the National Society of Denture Prosthetists, Boston, Mass., August 20, 1920.)

THE present paper is a continuation and completion of the paper which I presented at New Orleans, last October, on the same subject. The significance of what I have to offer today will be clearer if I briefly recapitulate the former report.

It will be remembered that this work was undertaken as the result of an experiment which I made in my own mouth. I found that a bit of pencil point fastened between the lower central incisors could, by movements of the mandible, be made to inscribe on a card fastened to the upper teeth.

These diagrams revealed some very important facts. They show that when the jaw movements are freed from the controlling action of the cusps, the mandible has, within a gauge of nearly a centimeter, universal movement with a constantly changing rotation point. This suggested quite a number of points in the intricate problem of mandibular movements that were open to further investigation.

Perhaps the two most important questions suggested were these: Do the cusps of the teeth guide the movements of the mandible during mastication in a perfectly determined and fixed path, as the interlocking cogs of wheels guide movement, or is there considerable freedom of movement subject to the will or nervous reaction from stimulus? Was the record in my own mouth an exceptional one and do mouths vary greatly in this capacity for freedom of movement? The bearing of these questions, you see, is intensely practical in their application to dental prosthesis.

Just to the extent that there is freedom of movement in different directions with a constantly changing rotation point, just to that extent the teeth are not guided in a rigid manner, in one direction only, by the relation of the cusps of the upper and lower teeth. If this freedom of movement exists and is functional in natural dentures in a considerable proportion of instances, and if it should be found that mastication is most easy and efficient when there is the greatest freedom of movement, what is the bearing of this fact on the use of articulators with fixed rotation points?

To anyone accustomed to thinking and working by the scientific method, according to Descartes' golden rule for the method which is never to accept anything as true but what is so obviously so as to leave no room for doubt, the extent to which methods of practice are accepted on supposed authority without ever being subjected to Descartes' test is simply astonishing. Practice based on conclusions drawn from an insufficient number of facts and from unverified statements is the rule everywhere.

In the discussion which is to take place here, I am going to ask you to pigeonhole all statements that you do not know to be facts and consider the

facts first, then see that the alleged facts are verified before you accept them. That is the scientific way of working and no conclusions are worth a moment's attention that are not reached in that way.

I have no conclusions of my own at the present time to offer, not a single one, but I have what appears to me to be important facts to present for which I ask your unprejudiced consideration. I have said that one of the suggestions which the experiment in my own mouth gave me was the possibility of great difference of freedom of movement in different mandibles and the bearing of this on articulation with fixed versus movable rotation points.

Acting on this suggestion, the first thing I did was to examine a large number of skulls for the purpose of observing the shape of the glenoid cavity and the relation of the heads of the condyles to their cavities. Obviously, freedom of backward movement of the condyle, from its normal resting position, depends entirely on the relation of the condyle to its cavity.

The result of this observation was to confirm what had been several times stated by other investigators, in fact to confirm, for my own purposes, what was more or less common knowledge to all students of comparative anatomy, viz., that there is a great variety in the shape of the glenoid cavity and in the relation of the heads of condyles to their cavities. In order to clearly show the differences, you will recall that I exhibited at New Orleans quite a number of sectional views of condyle relationship to glenoid cavity. In nearly all cases in which the cavity was deep, the space between the back part of the head of the condyle and the wall of the cavity was small. In most cases in which the cavity was shallow, there was far more space between the condyle head and the back wall of its cavity.

This would suggest the conclusion, altho that conclusion would not necessarily follow, that in cases where the glenoid cavity is shallow, there is greater backward movement of the condyle from its resting position, and just to the extent that the condyle moves back on one side, while the opposite one is moving forward, will the rotation point of the mandible be toward a central position? In all cases in which there is as much backward movement on one side as forward movement on the other, the rotation point will be exactly in the center.

Confirmation, to some extent, of the hypothesis that a central rotation point would be found in cases in which there was marked freedom of movement of the mandible, was seen in many of the Eskimo's skulls. It is a matter of observation many times recorded that these northern people have great freedom of movement of the mandible. I found many cases of wear of the teeth in the Eskimo's jaws examined, which indicated a central rotation point and in all of these cases the glenoid cavity was shallow and there was marked space between the condyle head and the back wall and floor of the cavity.

Clearly, then, the next step to be taken for the value of its practical bearing on our work in dental prosthesis was to secure accurate measurements of movements of the mandible in a large number of cases in living subjects. It seemed to me that in all methods hitherto devised for measuring mandibular movements, the possible margin of error was too great for thoroly dependable results. I worked over this problem more or less for two years and devised a number of methods for recording these movements, one of which was endorsed by one of the highest mathematical authorities in this country. The method which I finally hit upon, the results of which I am to show you today, was suggested while watching my son, Dr. Percy Norman Williams, taking a record with a machine of his own invention, which is

exhibited at this meeting, of casts of an upper and lower set of teeth in his practice of orthodontia.

I regard the method of making records of jaw movements which I have devised by aid of this machine as being as near to mathematical perfection as we shall ever reach. Its accuracy is represented by the mark of a needle point.

The method may be described as follows: A subject is selected with a full or nearly full set of teeth in which there is reasonably good occlusion and articulation. The movements of the

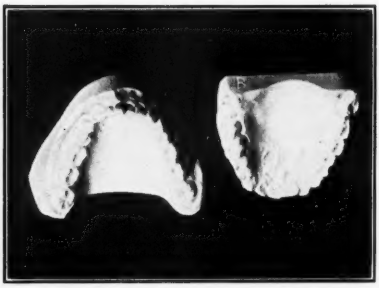


Figure 1.

mandible are first carefully observed, especially with reference to the relative position of the upper and lower incisors in all lateral movements. The reason for doing this will appear in a moment. Three wax bites are then taken in this way: Two or three sheets of ordinary impression wax are warmed and fastened together. A pattern is cut from this, somewhat larger than the size of the arch, but cut out in front so as to fully expose the incisor teeth while taking the bite. The wax pattern is warmed and a bite taken with the teeth in the normal resting position. A second bite is taken with about the amount of lateral movement used in normal mastication. A third bite is taken with as much lateral movement as the subject can make without obvious effort. The cutting away of the wax at the front, so that I can observe the relative positions of the upper and lower incisors while the different bites are being made, enables me to see that the lateral movement is normal and to avoid any projection of the mandible.

The next step is to take impressions and secure casts of the upper and lower teeth. Two needle or pin points are prepared about half an inch in length

Figure 2.

and waxed in position, one exactly between the lower central incisor, and the other in the place of the distal buccal cusp of the lower first molar, allowing these points to project about one-half mm above the masticating surface of the teeth. (Figure 1.)

We are now ready to bring these models together in the three wax bites. The bites are slightly warmed and the models pressed firmly together in each of them in the order in which they were made; first, the normal resting position, then the small lateral movement bite is used and this is followed by the record of the wider lateral movement. If this

procedure has been properly carried out, we shall now find recorded on the upper plaster model, three needle-point marks in the incisal region and three in the molar region. This cast is now placed in the odontograph (Figure 2) and a record made on a card of the outline of all the teeth in the arch and the positions of the needle-point marks. This record is then accurately centered on the Bonwill triangle and the needle-point mark,

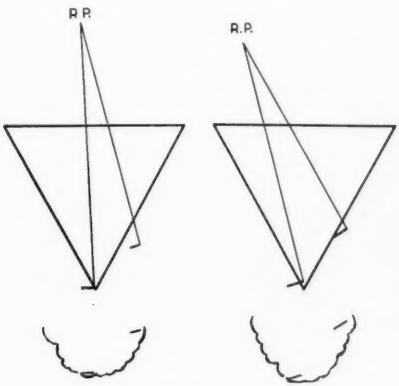


Figure 3.

representing the normal resting position of the space between the lower central incisors, is placed exactly over the apex of the triangle. (Figure 3.)

All of the needle-point records are then punched thru and recorded in the proper position with reference to the Bonwill triangle. When this record is made, we take a pair of dividers with needle points and insert these points in the impressions we have on the card, first in the incisal and then in the molar region. We take the small movement first. With the needle-point dividers firmly fixed in position, we place a thin steel straight-edge against the divider points and draw a line four or five inches in length. (Figure 4.)

We then use the record of the larger lateral movement and draw another line. Sometimes the two lines will correspond and sometimes they will not. When they do not correspond, we know that during the course of the lateral movement of the mandible, the rotation point changed and that the time when it changed was the moment when the backward movement in one condyle ceased because it had been forced back as far as it could go

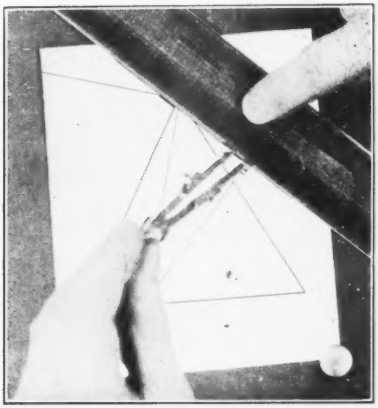


Figure 4.

and the rotation point was thrown into the vicinity of that condyle.

Having drawn our lines in the incisal and molar regions we place the equator of a transparent protractor on these lines, (Figure 5) first on the incisal and then on the molar line, and mark the points of the poles of the protractor. With a straight edge we then draw lines thru these points. The spot where the converging lines from the incisal and molar regions meet will, of course, be the rotation point for that mandibular movement.

Up to the present time, I have made sixteen records by this method. Four out of this number, or 25 per cent, showed a rotation point in which we may call

a central rotation area, that is to say, the rotation points were in varying positions nearer to a central line than they were to the region of the condyles. In all

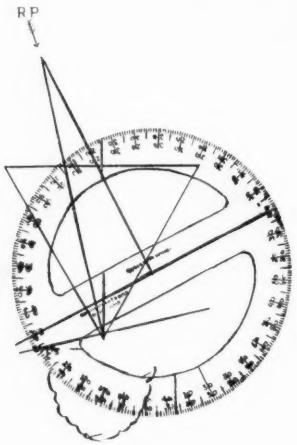


Figure 5.

four of these cases, when the more extended lateral movement was made, the rotation point was thrown into the condyle region. (Figure 6.)

In twelve of the cases measured, the rotation points varied but very slightly thruout the whole course of the lateral movement. The probability, based on the evidence which we have, is that in all of the cases in which there is no substantial change of rotation point during lateral excursion of the mandible, the glenoid cavity is more or less deep and but little space between the head of the condyle and the back wall of the glenoid cavity. This hypothesis perfectly fits all of the facts in our possession. Some interesting individual peculiarities appeared in these records. In the one now shown on the screen we see a fixed rotation point for the lateral movement on the side thruout the complete excursion of the mandible. (Figure 7.) This point is about two inches behind the condyle and almost directly in line with it. For the lateral movement on the other side, we start with a central or nearly central rotation point which changes, after the first small movement, to a point near the condyle. The question naturally arises, why should the rotation point on one side be so much farther behind the condyles than on the other?

This brings up another very interesting phase of this subject. It has long been known that in many, probably in nearly all instances, there is more or less side slips to the whole mandible during lateral movement. This method of recording jaw movement, which I have devised, enables us to accurately measure this side slip of the mandible. The more there is of this side slip, the farther back the rotation point is thrown. In

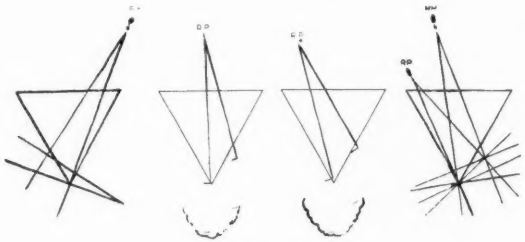


Figure 6.

this case, in which the rotation point changed on one side but not on the other, I repeated my record to make certain that no mistake had been made. This subject was a dentist and after the second record had been made, I called his attention to the peculiarity. He then told me that he had always noticed that he had greater freedom of movement in one lateral excursion of the mandible

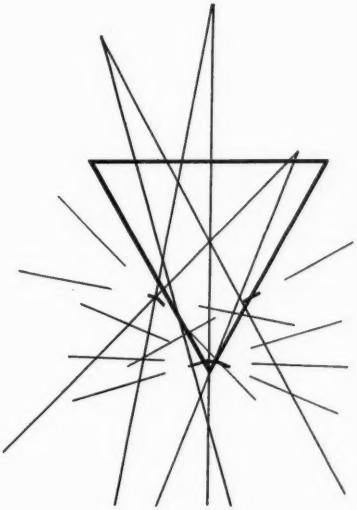


Figure 7.

than in the other. He attributed this to the fact that his teeth on one side of the arch were not in normal position. He was probably right in this conjecture. I show you the second record of this case (Figure 8) with the outline of the arch in which the irregularity on one side is seen.

Another interesting case, a record of which you see on the screen (Figure 9), shows marked variation of the rotation points on the right and left sides, but with so much side slip of the entire mandible that both rotation points are thrown entirely outside of the head.

In this view (Figure 10), we have assumed a usual rotation point with a lateral movement in the incisal region of 8.30 mm. This is much more than the normal movement of mastication but not more than is sometimes shown in making records of jaw movements. I have used the extended movement for the sake of showing the smaller movements in other regions. For the amount of

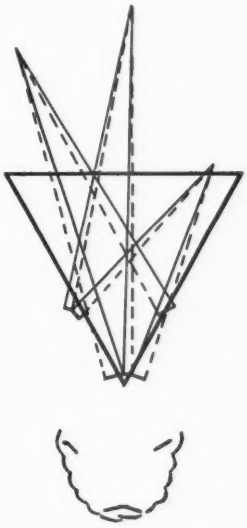


Figure 8.

movement recorded in the incisal region you see what the movement was in the molar region and what the backward, forward and side movements were in both condyles.

In order to test the accuracy of this method of making records, I assumed a backward or forward position of the record of the needle point in the molar region of one-tenth of a mm. This amount of error changed the rotation point as shown in the diagram now exhibited. (Figure 11.) In no case in which I repeated my records was there

as much variation found as is here shown.

The other records which I have to show, call for no particular comment. (Figure 12.) In this one you see four records which represent about the average position in which I have found the majority of rotation points, that is to say, about 2½ inches back of a line drawn between the condyles and in varying distances from the center, but most

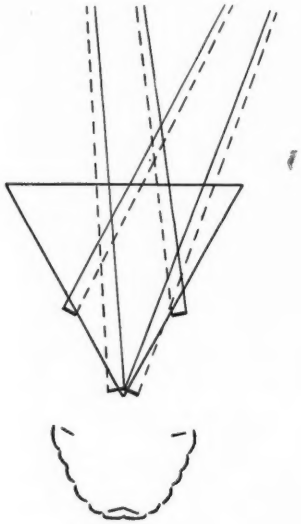


Figure 9.

frequently nearer a line running back of the condyles than the center.

I am, of course, well aware that the number of these records is too small for final conclusions as to their bearings on articular construction. But taken in connection with a study of the worn cusps of natural teeth they strongly suggest greater freedom of movement, as a requisite for the most efficient mastication, than a rigidly fixed rotation point provides. If we study a large number of natural dentures in all degrees of wear, we are simply forced to the conclusion that increasing wear shows that the

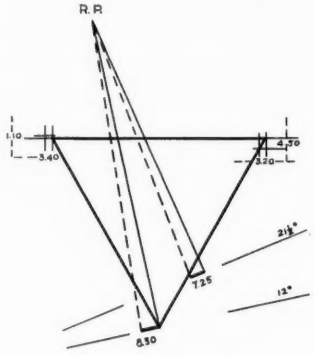


Figure 10.

mandible must move, not only in more than one lateral direction, but also backward and forward. I have often observed a great variety of movements in

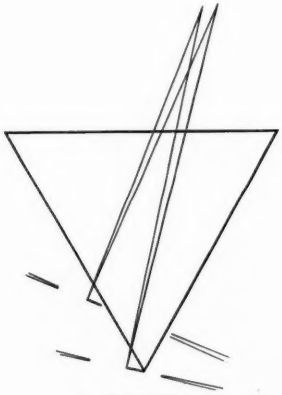


Figure 11.

mastication by watching living subjects. The direct bearing of this is on the importance of an articulator which shall be efficient as a grinding machine for producing freedom of movement in

the cusp relationship of upper and lower dentures.

If an examination of a large number of glenoid cavities revealed practical uniformity of shape with considerable freedom of movement of the condyle in its cavity, then I should feel bound to agree with Dr. Hall and recommend an articulator with a central rotation point. But we find that this is not the case. It will probably be found that in a majority of cases in the so-called highly civilized races of today, the glenoid cavities are deeper and more contracted, antero-posteriorly, than in more primitive people.

These facts also seem to me to have a direct bearing on the question of shallow versus deep-bite teeth. It would seem to me that the modern tendency toward restricted lateral movement of the mandible would be the first justification that could naturally be urged for the use of deep-bite teeth. A study of comparative anatomy of the jaws and teeth tends to confirm this view. But then we find that the more restricted the backward movement of the mandible, the more the rotation points are thrown outwardly which is exactly the opposite of Dr. Hall's method. In other words, there seems to me an anatomical inconsistency

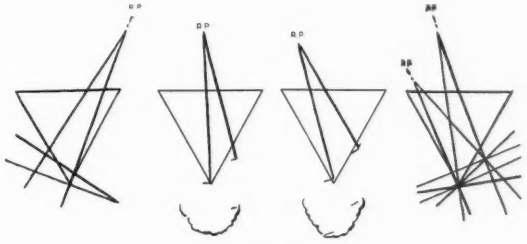


Figure 12.

There is a growing tendency, I believe, in this direction. Vigorous mastication tends to development of freedom of movement of the mandible and freedom of mandibular movement, especially in the early years of life, would tend to increase the free play of the condyles in their cavities. This would all be in the direction of establishing central or near-central, rotation points. But we find the modern tendency, as I have said, all in the opposite direction. Modern methods of cookery and habits of mastication do not encourage freedom of mandibular movement, but the contrary, and this means an increasing tendency for the rotation points of the jaw to be thrown outwardly.

between the idea of deep-bite teeth and a central rotation point. If I were called upon to defend the use of deep-bite teeth, I should certainly do so on the ground of restricted mandibular movement and outward rotation points. I understand, of course, that you may grind the masticating surface of the teeth until you get freedom of movement on a central rotation point, even tho the jaw may be actually working on outward rotation points, but that course does not in any way meet my scientific objection. It is open to discussion that a compromise between scientific accuracy and simplification of technic and convenience in working justifies the use of a central rotation point, but I do not see how it

can be defended on purely scientific grounds with the facts now before us. I hope Dr. Hall will take all of these points up in his talk this afternoon.

But while the records of natural jaw movements do not seem to me to justify the use of an articulator with a central rotation point, I think all of the facts point to the probability that the highest degree of success in the functioning of artificial dentures will be reached when there is considerable freedom of movement of the mandible in all directions, even when the upper and lower teeth are in contact. All tendency toward rigidity and the forcing of movements in one direction only tends to cause irritation of the mucosa on which the dentures rest. In fact, I believe this to be the chief cause of the irritation so frequently met with. In the finest and most perfect natural dentures there is marked freedom of movement of the mandible in mastication.

The best artificial teeth that are made today permit this freedom of movement with but little grinding and at the same time when properly placed, the occlusion is more nearly perfect than is found in natural teeth.

In view of the fact that what is regarded by many at the present time, as the highest accomplishment in the technic of dental prosthesis is not being taught in practical detail, in more than one or two, if in any, dental colleges in the United States, it seems to me that the very first duty of this society in the interest for which it was organized, is to work out such a simplified system of technic as will be acceptable to all, or a majority of the colleges, and at the same time be a system which will yield average results decidedly in advance of present average. That task should not be a difficult one and to the end which such an undertaking would have in view, most of the facts which I have presented in this paper, might be made contributory.

SURVEYING DENTAL EDUCATION.

By GUY M. WHIPPLE, Ph. D.
Professor of Experimental Education, University of Michigan.

(Read before American Institute Dental Teachers.)

DURING the past ten years there has been a most extraordinary development within the field of education of a new point of attack, of a new method of approaching educational problems. This is the method of measurement. Tho the average university man knows something of this development, still, unless he has been directly engaged in the problems of education, especially in fitting teachers for work in the schools, he does not generally have any adequate idea of the extent of this measurement movement or of the importance it has assumed in the schools. Suffice to say that no wide-awake superintendent of schools or school principal can afford nowadays to remain in ignorance of this new point of view and that the thousands of classroom teachers are thoroly conversant with even fairly technical details of the methods that are employed.

The general principle involved in the measurement method is to take nothing for granted that can be verified, to replace opinion by fact wherever possible, to test the results of educational training by the use of measures that have been standardized, to compare the results of different methods, of the work of different school systems, of different teachers, of different pupils—in general, to translate progress made, performances done, results secured, into quantitative and definable form.

For various reasons, this development of methods for measuring educational work was directed at first, and for some time, almost exclusively to the work done in the elementary grades of the public schools; there were produced, for instance, scales for the measurement of handwriting, of spelling, tests for measuring the speed and accuracy of work in addition, subtraction, multiplication and division, for rating quality of reading, for determining size of vocabulary, number of facts known in history and geography, etc. Since then, we have had constructed numerous scales for measuring the achievements of high school pupils, as in algebra, geometry, Latin, physics and so on.

There was also about this same time a considerable advance in the development of methods for measuring and recording other facts about the operation of schools, as for instance, the extent of failure of pupils, the number of pupils who drop out of school at each grade and at each age, the causes of this elimination, the effect on school progress of different systems of promotion, the best system of marking and grading pupils in reporting their work, etc.

Once more there was developed, also roughly about this same period, a remarkable interest in methods of measuring the amount of general intelligence possessed by pupils, methods of determining their native capacities and of using this information for the better planning of their education. You are

all familiar with the recent extension of this general idea to the measurement of intelligence of over a million and a half of the men who formed Uncle Sam's great army in the war.

In this war, too, there were developed, chiefly by men trained in applied psychology, certain very rapid and yet very reliable methods for determining the amount of skill and professional expertness possessed by men who claimed to be experts in various trades, like carpentry, plumbing, running a turret lathe, stringing telephone wires, driving trucks, etc.

Now, with the exception of this work in the army, most of these various ideas for measuring human beings had their inception and their development primarily in connection with the education of children. They are now challenging the attention of those charged with the administration of higher education; they are now interesting men charged with the training of adults. Assuredly, in principle there would hardly seem any room for debate when one asserts that, if there exist methods that would enable us to express the outcome of our teaching in precise quantitative terms, we ought to make use of these methods when we are planning to improve our work.

In the case of the public schools the various measurement methods I have just mentioned, were frequently combined into what was known as a "Survey." There are several city school systems and some entire state school systems that I happen to know of that at this moment are being surveyed by educational experts. The idea of these surveys is to use measurement methods in such a way as to determine exactly the condition of the schools and to set forth the results in a series of tables or graphs that will summarize compactly all the facts of importance that can be discovered.

In the field of professional education there has been attempted of late a similar survey of the educational situation. I refer to the "Study of Engineering Education," prepared by Charles R. Mann and published by the Carnegie Foundation for the Advancement of Teaching in 1918. This report was prepared by Mr. Mann at the instigation of a joint committee on engineering education of a number of engineering societies. The American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Chemical Society, the American Institute of Chemical Engineers, the American Institute of Mining Engineers and the Society for the Promotion of Engineering Education were all convinced that there was room for decided improvement in engineering education; they decided that the problem was a big one, that they might profitably combine to study it, that they ought to have the services of an expert to make the investigation just as they would themselves be employed by others as experts in their own particular lines of engineering. They succeeded in enlisting also the cooperation of the Carnegie Foundation and finally, as I said, engaged Professor Mann to make the survey of conditions in engineering education.

I mention this report because when it was suggested to me by the president of this meeting, Dr. Bunting, that there were many unsolved educational problems in the training of dentists, my mind immediately recurred to the Engineering report and I suggested to Dr. Bunting that it struck me, off-hand, as if an examination of the problems of dental education might very likely be undertaken with profit along lines closely parallel to those followed in this examination of engineering education. In what follows, accordingly, I have merely tried to sketch out roughly some of the points that might be consid-

ered if one were asked to draw up a report upon dental education analogous to the report on engineering education. I will state at the outset, that I have no expert knowledge of dental education and don't pretend to; I state this to save you from expending breath in proving it to me; I admit it now! But I do claim to know something about the methods that have been successful in studying educational problems in other fields of teaching, and I have a suspicion that here and there some of them might apply to the situation in the teaching of dentistry. If none of them do, if you perchance have no problems, if they are all satisfactorily settled, I congratulate you—or rather I was going to congratulate you, but I'll say I'm sorry, because it must take some of the joy out of life to encounter nothing that needs study or changing!

I. The Development of Dental Schools in the United States.

A preliminary study might possibly profitably concern itself with the main features of the earlier dental schools: When were they started, who started them, what was their aim, their course of study, their method of admission, their requirements for graduation, their financial resources, their successes and failures?

II. Main Features of the Evolution of Dental Schools.

Taking the history of some half dozen of the older dental schools, what have been the most striking features of their evolution and what factors brought these changes about?

III. Dental Schools of the Present Day.

1. *General Statistics*: Their number, distribution, adequacy to the demand; their resources, equipment, etc.

2. *Administration*: Here might be raised various problems concerning control of the institutions; who determines educational policies; who makes staff appointments; who determines requirements for admission and graduation; who determines what shall be taught, how it shall be taught, who shall teach? What are the interrelations with other colleges, schools, etc., like medical colleges or university administrations generally? These are problems outside my own field of interest and I shall merely mention in leaving them that they do really affect the efficiency of the classroom teaching quite directly.

3. *Curriculum*: Here would be raised such questions: What are the courses offered to students in dentistry? Which ones are required; which elective? In what order must these be taken? How early does the student get into personal contact with actual operative dentistry? How much agreement exists among the curricula of different dental schools? Where there is divergence, why has it appeared, and which plan is the better? Is specialization encouraged or discouraged? How much of the curriculum produces direct increase in dental knowledge and skill? Which courses are of doubtful utility, as judged by students, by the staff, by graduates in the field?

4. *Methods of Instruction*: To what extent is the lecture method, the class discussion, the oral quiz, the written examination, the demonstration, the practicum or laboratory exercise used in each course offered in the dental school? What differences exist in these respects in the same course offered in the same school by different instructors, or in different schools? Which method is the best? What methods are used to teach students how to study? Is any use made of texts now on the market to help freshmen to use their minds more effectively? What methods are used to test the proficiency of students in various courses? How reliable are these methods? What marking system is used to report results? Is the system reasonably reliable?

5. *The Teachers*: What are the qualifications of the teachers in dental schools? How are they selected? Have they ever had training in the art of teaching or are they all just natural-born teachers? Do they give all their time or part of their time to instruction? If part-time, is the effect good or bad on their teaching? What is the relation of supply to demand for dental teachers? Is anyone charged with responsibility to train men for careers as dental teachers? Is the remuneration enough to attract competent men? How long does the average man on the staff remain in the work of teaching? Does the teacher have time and inclination to prosecute research? Is promotion conditioned upon mere length of service or pull with the administration or efficiency as a teacher or reputation as a research man? Does anyone ever inspect the teaching or advise the young instructor as to the best methods of presenting his subject? (Cf. College of Engineering at Illinois inviting members of Education Department to visit and discuss their teaching.) Does the young instructor ever visit the classrooms of his colleagues to see them in action? Does the staff ever get together to discuss methods of instruction, etc?

6. *The Students*: How many students are studying dentistry? Is the supply more than adequate to the demand? If it is, do the schools raise their standards? If it is not, do they advertise their wares and solicit more students?

What kind of men go in for dentistry? Are they superior, inferior, or equal when compared with the men who go into law, medicine, engineering, journalism, or into business generally? What decides most dental students to go in for dentistry? Are their reasons justifiable? Are their decisions sound, on the whole? Does anyone in the dental school concern himself about getting the right men into his school and keeping the wrong men out?

What kind of a man makes a good dentist anyway? Does he need average, superior or very superior intelligence? Does he need superior manual dexterity? Does he need a special amount of any specified trait or traits, such as perseverence, industry, initiative, enthusiasm, independence, pleasing appearance, neatness, orderliness, sociability? If any of these traits are especially needed, is any attempt made to see that they are possessed by students when they are admitted or that they are instilled into them during their stay in the dental school.

Out of every 100 men who enter a dental school, how many complete the course successfully? Is dentistry any better off than engineering, wherein 60 of every 100 admitted, fail to continue thru the course? Of these 60 men who fall by the way, how many fall out the first year, how many the second, the third, and even the fourth? Why do they fall out? What courses, teachers, methods, policies or other conditions are responsible for their elimination from the career they thought they were destined to follow? Can this condition of affairs be bettered? Whose business is it to better it?

What is the attitude of the students toward their work in the dental school? Do they feel that they are working for you or for themselves? What proportion of them give reasonable time and energy to their work? How many of them are "soldiering?" What motives animate their daily work? How many of them, for instance, resemble those engineering students whom I once questioned to discover why so many of them just barely passed in a certain course and who said in explanation: "A good engineer always plans his work to meet a given load demand; he then adds a 10% margin of safety; if he adds more he wastes time, materials, energy and money. To get

90 in a course in which 60 is the pass mark shows pretty poor judgment and planning." Or, again, in the more homely phrasing of another student: "What's the use of running after a car when you've caught it?"

7. *The Graduates*: How many of those that graduate succeed in their chosen profession? What's the reason for the failures of the others? Has anyone sought to check back from the after-careers of graduates to determine which aspects of their dental education were functioning effectively, which not; to see what elements might perhaps be added to strengthen their professional preparation? What is the attitude of the graduates toward their dental school? Are they loyal alumni? Do they boost it? Do they thoroly endorse its methods and policies?

I have raised these numerous questions just as samples of the sort of things that might be asked. In my ignorance of your more intimate problems I expect many of these questions may be already answered, but I venture to guess that I may have asked a few that interest you and that are still unanswered. I would like, in what time remains to me, to suggest some methods by which two problems might be approached in more detail.

First, let us take the familiar problem of testing the results of instruction. Ordinary classroom work is commonly tested by oral quizzes and by written examinations. The chief fault of the typical examination is the comparatively small number of topics that can be covered in the time available, the large fraction of this time that is wasted by the student in writing of words that are merely "filling" in which his real ideas are conveyed, the inordinate amount of time that is consumed by the examiner in reading this filling to get at the relatively few crucial points in the examination, and the general unreliability of the examiner's effort to translate his impression or estimate of the examination book into some sort of conventional marking system. Now, in the standardized scales that I mentioned earlier in this paper as having been developed for testing the work of school children, these difficulties are avoided, and there is no reason why the same thing cannot be done for examinations of the knowledge of students in schools of dentistry. To begin with, whatever be the form of an examination, it is possible after sufficient trial to standardize the questions in it. I mean that their value as tests of the student's real knowledge of the subject can be mathematically determined. Some of these questions will be found to be absolutely useless in measuring the results of instruction; for instance, a question that no student can answer or a question that any student can answer is no measure at all of the relative ability of the students; again, one question will be found to check up well with the known proficiency of students; another to check up poorly—just as in the army trade tests the task of the examiners was to discover 20 questions, each one of which differentiated between experts, journeymen, apprentices and novices in any given line of trade ability. Generally speaking, then, it is possible by proper methods, very greatly to increase the precision of any set of examination questions or test exercises as measures of information or skill.

As to the form of the examination, I have time to mention only a single example of a method that can be used to advantage in many cases. Go over the work of the course that is to be tested. Prepare 50, or better say 100, statements—short direct sentences that bear upon items or points brought out in the course. Arrange 50 of these statements so that they are correct; 50 of them so that they are incorrect; as for instance, "Every healthy tooth is supplied with a nerve." "The first permanent teeth to

appear are the upper canines." Have the student mark with a plus sign every correct statement, with a minus sign every incorrect statement. Scatter the correct and incorrect statements by chance in the list of 100 statements. Supply your stenographer with a key and let her correct the papers. There you are! No work for the instructor! No writing for the students! One hundred judgments to be passed by him in one hour instead of six of eight questions to be "written around!" I'll make you a present of this suggestion!

Second: Let us take up the matter of testing the intelligence and testing the skill of dental students.

The native intelligence, the intrinsic all-round mental capacity of any person who can read, can be measured inside of an hour with a very high degree of precision by methods that the applied psychologist has developed and that have been demonstrated by their applications to more than a million and a half army recruits, to several hundred thousand school children and to probably more than 50,000 college students. I leave it for you to judge whether a man ought to have a superior degree of intelligence to make a good dentist! If you admit that dentists are a superior lot, and I don't hear any chorus of denials, then why not find out what grades of intelligence are now being admitted to our dental schools and what grades of intelligence are needed for undertaking the dental curriculum? If it turns out that a certain percentage of the men now admitted to dental schools fail to continue thru to graduation because of inferior mental capacity, why not set up a sieve at the door and permit none of these inferior minds to undertake the work at all? At the suggestion of Dr. Bunting and with the authorization of Dean Ward I tested every dental freshman at the University of Michigan a few weeks ago. This examination took 45 minutes; it was administered to all the freshmen at the same hour (and on the following day, I may add, to all the freshmen in the College of Medicine as well; all our engineering freshmen have already taken another special set of tests designed to test engineering aptitude—tests that have now been given to some 32,000 engineering freshmen in the United States). The examination cost less than 20 cents per freshman. The results are locked up in the safe at the dental school and they will soon be compared with the outcome of the first semester's examinations. It will be strange if the tests do not "shell out" the poorest students.

Finally, there remains the matter of testing the *skill* of dental students. I understand that a certain fraction of dental students turn out to have so little manual skill that they make bungling operators. If this is the case, it certainly seems a great pity that this incapacity could not be located at the outset and the student, the instructors and the public saved the waste of time, energy and money involved. In principle, it ought to be possible to isolate the various traits that combine to produce skill in operative dentistry and then to discover fairly simple and direct methods for measuring the amount of these traits possessed by each entering student, at least with sufficient precision to predict the failure of the most incompetent men. A tentative plan for an investigation of this problem has been drawn up in the educational laboratory at the University of Michigan, as follows:

First, as a preliminary, data should be gathered from representative dental colleges concerning methods of admission of students, with special reference to the qualifications, other than merely academic status, which are demanded. The methods of training dental students in the distinctly manual phases of their work should be studied in detail; likewise any methods now used to test man-

ual skill. Other preliminary steps will include the collection of the views of experts on the types of men and of ability required for success in dentistry and on the reasons for success and failure and similar matters.

The next step will be the assembling and standardizing of a group of tests, which should, perhaps, include the following:

1. Tests of general intelligence.

2. Tests of special abilities, particularly motor abilities, as for instance, such tests as:

   a. Speed of finger movements.
   b. Accuracy of movements.
   c. Steadiness of movement.
   d. Amount of involuntary tremor.
   e. Visual acuity.
   f. Color-blindness—its presence or absence.
   g. Discrimination of lifted weights.
   h. Visual apprehension, emphasizing especially the reproduction of visual forms from memory.
   i. Spot-pattern—a test of apprehension of topographic relationships.
   j. Form-board.
   k. Cancellation—quick reaction to visual forms.
   l. Simultaneous disparate activities.
   m. Mirror-drawing—control of new hand-eye connections.
   n. Modelling — reproduction in plasticine of models, from the models and also from memory.

3. As the investigation proceeds, it may be found desirable to add a few more tests, of a highly specialized sort, in which the actual instruments used in operative and laboratory dentistry might be employed, details of this procedure to be worked out by dental teachers.

The final step will then be the application of this tentative scale of tests (1) to a group of practicing dentists, (not too long out of dental school); (2) to a group of present seniors in the dental college, upon whom estimates of their probable success as dentists can be obtained from their instructors (in this group, of course, there should be individuals from both ends of the ladder of ability and from the average as well), and (3) to a group of the present freshmen. The results secured from this experimentation should then be checked carefully with the available records of the individuals tested, and, in the case of the practicing dentists, with their apparent success in their profession, with a view to determining the ability of the tests to select the most capable men.

If this piece of experimentation should turn out favorably, we would secure a set of tests that might be applied to students of dentistry early in their dental school career in such a manner as to predict several years in advance, the men who would fail as operative dentists.

Conclusion.

The object of this paper has been to put before you some suggestions by an outsider whose claim to a place on your program can be substantiated only if these suggestions turn out to contain some hints that will provoke discussion and possibly stimulate to a more intensive consideration of the whole problem of dental education. The justification for offering the suggestions lies primarily in the fact that they have been drawn from actual work done in other branches of educational endeavor. It is my hope that they may not be entirely unfruitful when applied to your own field of endeavor.

Discussion.

R. D. Thornton, Toronto, Canada.

I have enjoyed Mr. Courtis' remarks. It seems to me that the really essential thing we need is more psychology among

dental teachers, for we do not understand as we should the processes of the student's mind in grasping new ideas. If there is anything that has been driven home to me in particular it is that one thought.

A. E. Webster, Toronto, Canada.

I can assure Mr. Courtis that the subject matter of the recitation in dental anatomy was needed. There is no attempt to teach more accurately than we need. The subject which Dr. Thornton was to cover was set for him, and I believe that we all would concur in the view that what to teach was outside of his choice at the present moment.

F. C. Waite, Cleveland, Ohio.

This paper has shown some of the weak points in the teaching of dental students, and it is to be hoped that teachers will profit by the criticisms that have been made.

The method usually adopted for measuring the capacity of students in professional schools lacks in accuracy because we bring too few factors into the result.

We all know that in physics, or in any exact measurement, the accuracy of the final results increases in proportion to the number of individual measurements made, since the average of a large number of separate measurements of the same object or phenomenon decreases the factors of error due to personal equation or fortuitous errors.

Likewise, in measuring a student's capacity in a subject, we should make many recorded measurements during the progress of the course, all of which should enter into the final estimate. Frequent tests and frequent estimates of skill as shown in practical work should be made and recorded and be averaged in some definite proportion. The single final examination is influenced too much by personal opinion, by impressions and by the peculiar circumstances of that one final test, to be used as the sole basis for judgment of the student's capacity.

Our educational system in professional schools, is too much a method of examinations rather than a method of instruction. In the professional schools, if there is one phrase that will describe our failings more than any other, it may be expressed in the statement that the teacher does too much talking. I think that on the average in professional schools the teacher talks and does not give the student a chance to talk. There are too few conferences, too little discussion, too few quizzes. This is especially true, I think, of younger teachers.

Reference has been made to the question of the number of failures. A high percentage of failures in a given course in my opinion does not give as much data in regard to the incapacity of the student as it does as to the incapacity of the teacher. When an administrative officer in a school finds that in a certain course, 30, 40 or 50 per cent of the students are failing, he should not look after the students, but rather look after the teacher, for the fault is more likely to be there.

There is no doubt but that there is great need of a survey of dental education. A survey of our work has never been made. No consecutive study of it has ever been carried on. We come to the meetings and discuss various phases of teaching, give our opinions, then go home and think that we have accomplished a great deal. But the entire subject ought to be gone over carefully by some one who is an expert along educational lines. If this could be done, it would save a large amount of time which otherwise we shall spend in trying out this and that experiment. I imagine that a careful survey of dental education made at the present time would advance dental education so far as we would be able to go in ten years by our present

methods. You are all familiar with the rather unsatisfactory, but still helpful, survey of medical education that was made by the Carnegie Foundation for the advancement of teaching in 1910 and the influence which it had. That influence was chiefly thru publicity. While publicity as to dental education would probably injure our pride, it would be very helpful.

I would like to suggest a very helpful thing that the psychologists can do for us, and that is to measure the fatigue of dental students. What we want in dental students is alertness. I am convinced myself, tho I have no data bearing upon the question, that one of our troubles in professional education—not in law as much as in medicine and dentistry—is that we have too heavy a schedule. The ordinary professional school is scheduling the men in the classroom up to 40 hours a week. If the students are going to do any outside thinking and studying, they have to do that after they have done seven to eight hours of reasonably hard work, and their fatigue is such that their mental alertness is very low. I wish that a psychologist could come into a typical professional school and measure the mental response to various tests of the student at the beginning of the year and at various times of the year after he has acquired a certain amount of fatigue.

Just a word on the question of types of examinations. There are three types of examinations that are ordinarily used in professional schools: the written, the so-called practical, and the oral. In my opinion the written examination should not be a lengthy one, consisting of detailed facts, but should be only a question of principles—a relatively short examination. The practical examination is the more important, and it should not be a repetition of something which the student has done; rather it should be an exercise devised to use the knowledge which the student has, but in an unaccustomed combination so that he will have to think. What we talk a great deal about is that we want to get our students to think. The practical examination in almost any subject can be devised to make a man put his knowledge together in an unaccustomed way to solve the problem presented.

The oral examination is, in my opinion, of very little value except as supplementary to the practical examination, when it should be an individual conference. When an oral examination is given in five minutes, the student does not get settled down so that you can judge very much by his answers. I believe that an oral examination can best be restricted to those students who are on the borderline.

President Bunting.

Dr. Whipple has suggested to us the possibility of a new development in dental education, adoption of certain methods of standardization by which we may not only measure the product that comes into the school, but also may measure their advancement as they go thru the school. We may, in this manner, measure the quality of the teaching which we are doing, and our own capacity as teachers. This question is now open for discussion: Do you believe that it is worth while to continue this analysis of teaching methods, or shall we drop the matter and wait five or ten years until the law, engineering and the medical schools have perfected it for themselves? In other words, shall we take the matter up after it has been perfected by them, or shall we make a concerted effort at this time to work out some of these problems to see if they may possibly be adapted to the dental situation?

Alfred O[illegible]re, Minneapolis, Minn.

The question is, shall we make a fresh start? I think that the dental profession is now on the eve of a new

departure; we ought to take the matter to heart and have a real critical analysis of our own situation, and re-orient ourselves, when we really know what is wrong with us.

H. E. Friesell, Pittsburgh, Pa.

I wish to express my appreciation of the remarks of Mr. Courtis. I have received a number of excellent ideas from what he has said and shall make an effort to apply them to our work. For a long time I have felt the need of training dental teachers in psychology, in the science of teaching, and have tired to figure out with the faculty of our school of education a course that could be devised and arranged for the members of our own faculty to drill them in the science of teaching.

I would also say that perhaps Mr. Courtis did not correctly construe the laughter of some of the members during the reading of Mr. Edmonson's paper. I am one who laughed, and I laughed principally at the ingenuity of the students in recognizing certain elements of much value in educational work which teachers themselves do not always appreciate.

Also I desire to add my little word of commendation to Dr. Whipple for the excellent paper he has given us and for the splendid presentation of the factors that are fundamentally important to dental teachers and in dental education, just as fundamentally important as in other lines of education. I might say that I was particularly pleased with and interested in this paper because of the fact that at Pittsburgh we are endeavoring to put into actual application many of the things that Dr. Whipple has explained to us. For instance, we have taken up the question of trying to decide, if possible, before matriculating a student, whether he is wanting in certain very definite qualities that we believe are essential to success in the study of dentistry. In the case of those who are near the border-line, who are doubtful and yet who are entitled to the chance, we are attempting to determine during the first year, before they get too deep into the process, whether there is any real hope for their eventual success. The same thing we are trying to apply to the standard of teaching in the various departments, in order to determine, if possible, the relative value of the various courses.

I regret that I did not have a copy of Dr. Whipple's paper so that I might have made a careful analysis of it, because there are in it many things that impressed me very forcibly during the reading, but which I cannot recall now. It is a pretty big paper, there is much in it that we should seriously consider, and we should not pass over it with a few compliments and then forget it until the transactions come out a few months later and perhaps shelve it at that time. I believe there are several schools in this association that are now putting in practice, at least in an elementary way, many of these underlying principles which will undoubtedly lead to what many of us have long recognized as necessary—a thoro analysis of what we teach and how we teach and why we teach, and the establishing of some reasonable standard in these things if we are to bring dental education to a point where we may be entitled to call it an efficient method of education.

Eugene H. Smith, Boston, Mass.

I think we have all been very deeply impressed and made better teachers by the suggestions contained in the various papers presented here today. Dr. Whipple has touched upon the crux of the whole thing—the making of an expert survey. I would move, therefore, that the Institute take the necessary steps to have an expert survey made of the educational methods employed by the various dental schools. (Motion seconded by Dr. Owre.)

A. W. Thornton, Montreal, Canada.

We should carefully consider this matter before passing the resolution. What shall be the extent of the survey, the nature of the survey, and just who have we at the present time that would make a survey which, after it was made, we would be able to use? I have been very much interested in this portion of the program, perhaps I was responsible for setting this ball rolling. I think teaching is the greatest work in the world, and the presentation of my paper of last year grew out of the fact that in connection with dental and medical schools I have seen a good many things that passed for teaching in these faculties, but if they had been separated from the activities of that particular faculty it would have been necessary to do what the children do when they draw on a slate the picture of a horse; that is, they write "horse" under it so you will not mistake what it is, and that is the only way you would not make a mistake in calling much of that which is done in the classroom, teaching. So there is need for better work. But it will require very, very careful thought indeed to obtain a vision of the nature of that work and the best means by which improvement can be brought about.

I have been delighted with what we have heard tonight. It is the first time I have felt that I sat in the seats of the nobility and have a taste of the higher life, and I have enjoyed it exceedingly.

The President: Would Dr. Whipple be willing to outline for us what he thinks would be the first step for us as dental teachers to attain the end we would wish to reach?

Dr. Whipple: I never took part in any such enterprise, so I do not know the proper way to go about it. I think a proper survey of any big field of teaching like that of dental education is a more elaborate proposition than looks on the face of it, and even those most keen to have it done would be perhaps those who would sit back and think how it would best be done. I do not know what the best device would be. Perhaps some committee rather representative of the different schools might get together and by correspondence or conference, discuss ways and means and the scope of such an undertaking—whether it would be possible to get different dental schools to subsidize or underwrite a cooperative investigation. That might be done, I do not know. I think it is a much larger proposition than could be done by a doctor's thesis, as was suggested. It might also be possible to obtain the cooperation of educational boards or the Carnegie Foundation, which are interested in education in general. The formulation of expert recommendations would take a lot of time and a lot of money and would have to be done by several very competent persons. So I think it is right to say that you should go carefully and know where the necessary funds are to come from.

G. S. Millberry, San Francisco.

Papers are inspiring, but motion to undertake a complete survey is too precipitous on account of the limited income of the Institute. Suggest that a committee be appointed to investigate and report at next meeting.

F. C. Waite, Cleveland.

The medical schools of the country have this same problem in view and have started the ball rolling in the Medical College Association by appointing committees which have now been working a year. I happen to be chairman of one such committee on my own subject. These committees are making an investigation of the teaching of the several subjects of the first two years of the curriculum, and each committee is charged with making a monograph, that is, getting all the data to show how the

teaching is being done. That is the first thing we are going after in medical education—to find out how it is being done now in the medical schools. And I had intended to suggest, in connection with Dr. Black's report on courses and syllabi, that the dental teachers inaugurate something similar, starting in a modest way, with the subjects of the first two years perhaps.

H. E. Friesell, Pittsburg.

I might add that work very similar to this is already being done thru your committee on courses and syllabi, of which Dr. Black is chairman. The work was started at the meeting in Atlanta last year, and the committee is ready to make its preliminary report on one or two phases of this subject.

Dr. Whipple has well stated that this is not something we should go at haphazard. It is a big problem and if we do not realize the scope of it, it would be very easy for a body of this kind to make itself ridiculous by attempting to lift itself by its boot-straps. The committee on syllabi and standardization of courses is, it seems to me, starting in at the right place by making a preliminary investigation of what now exists, and when we have that data we can then devise and recommend improvements in conditions. To start in duplicating the work which is already being done, it seems to me, is unwise. I simply call attention to the fact that such a committee already exists and has done a year's work on the problem.

A. W. Thornton, Montreal.

Referring to the question asked by one of these experts,—"How many men teaching in the dental colleges represented here have ever taken any instruction in the method of teaching?"—in other words, have been high school, college or university teachers before going into our schools,—I hazard the opinion that perhaps not one-half.

As the gentleman says, it would take years before the survey could be completed. In the meantime, our schools will have to be carried on. It is not reasonable to suppose that we ever will get in our colleges men trained as teachers, for the simple reason that if they were obliged to go thru the experience of high school or college teachers before going into dental work we could not get many trained teachers. But it would be possible to invite a number of expert teachers and psychologists to come here year after year to do just such work as has been done today, and I believe the men responsible for the dental teaching of the next few years will go home from here and be inspired to do better work. In that way we will bring about the best results in the shortest possible time.

C. R. Turner, Philadelphia.

I do not see how the work of the committee on courses and syllabi is identical with the investigation and report of the proposed committee. The proposed survey deals with a great deal more than the pure content of dental courses. It has to do with administration and pedagogy. I think the survey of dental education in this country is a consummation devoutly to be wished.

President Bunting: There are two propositions here. First, there is the presentation made by Dr. Whipple in which he outlined two particular methods whereby we may examine our students; namely, general intelligence tests and by tests of mechanical skill. In previous conferences, Dr. Whipple has outlined to me a research by means of which he believed that the various dental procedures might be standardized so that it might be determined whether or not a student is capable of learning or has learned the various mechanical principles which we attempt to teach. He referred to the method used in the

Army whereby one could, by a set of questions, determine the degree of efficiency in certain mechanical and technical procedures, and expressed the belief that in time we might work out the problem in dental education so that we would be able, in this manner, to evaluate our students. Also, before we had tried for two or three years to make a dentist out of a given entering student, we might be able to ascertain at the outset in a given case that the student is unfit and should not attempt the course. But the thing he particularly pointed out at that time, and I think he called your attention to it tonight, was that it takes considerable time to establish what they call the coefficient, the exact ratio of dental education. It may require years and a considerable expenditure of money to put the method on a working basis.

The other question which has been raised by Dr. Smith is somewhat different from that which Dr. Whipple presented. Dr. Smith's motion calls for a survey of the actual teaching methods used in our schools today, and the authorization of a committee of this body to institute such an investigation. This question is now open for discussion.

A. H. Hipple, Omaha.

This afternoon we have seen ourselves as others see us. We have learned many things important for us to learn, but we are liable to forget them. One of the principles of teaching, we are told, is to repeat facts frequently in order that they may be impressed on the mind of the student so that he will not forget them. In the case of teachers the same principle must be applied, for if the facts that have been presented here today are to have much effect they must be repeated. I know it is in the minds of all of us that it would be wise to continue this feature of the program, and in order that the Executive Board and the officers to be elected may know how this body feels I move that something along the line of educational methods as presented here today be incorporated in the program of next year's meeting. (Motion seconded and carried.)

Dr. Millberry: I think that the members of the Institute not only owe thanks to the gentlemen who have so kindly given of their time and intellectual substance, but also owe to them an expression of that appreciation. I, therefore, move that a rising vote of thanks be extended to Dr. Whipple, Mr. Courtis and Mr. Edmonson for a very enjoyable and profitable afternoon and evening. (Motion carried by rising vote.)

Mr. Courtis: We always get inspiration from other people who start on these problems. We are only beginning on these things ourselves and have our similar difficulties.

SOLVING THE MOUTH HYGIENE PROBLEM FOR CHICAGO.

By WILLIAM A. EVANS, M. D.
Health Editor, Chicago Tribune, Chicago, Illinois.

(Read before the Chicago Dental Society, April 20, 1920.)

THE Department of Education proceeds with its organization much more rapidly than does the Health Department. Townships, small villages, towns and cities, that have no health department at all have a well organized educational department. Under these circumstances it would be the gravest error to put medical inspection under a health department. On the other hand, we find that in the larger communities where there has been considerable development of government, there was just as strong a tendency to put the medical inspection of school children under the health department as there was a tendency to put it under the educational department in the smaller communities.

I have an anlysis of the replies to questionnaires sent to the larger cities of the United States, showing that the work of school inspection was under the direction of the health department, generally speaking, in the larger cities. A questionnaire of the same type in a smaller community, I am sure, would have developed the fact that in these communities it was the Board of Education. But we made a compromise recommendation, and this recommendation is worth considering. It was to the effect that the health commissioner should be an ex-officio member of the Department of Education, and that the Superintendent of schools should always be an ex-officio member of the department of health, thus bringing together these two departments. In no other way can you get the department of education to functionate to the fullest extent in the control of contagious diseases. On the other hand, in no other way can you get the department of health to understand the necessity of testing the behavior of positive health, as distinguished from the control of disease so commonly designated as negative health. The influence of cooperation on part of the workers themselves, and the children served by the departments would be better still.

The second recommendation was that in every schoolroom there should be kept a contagion history of every school child. The teacher should have at her command the cards arranged for the purpose of information as to the kinds of contagion the child has had to the end that she may be able at once to discover, when contagion threatens her schoolroom, which of her children were examined and which were found susceptible.

In the next place, there should be cooperation between the health department and compulsory education. As the truant officers went around they would discover cases of infection that had not been reported and homes in which quarantine was not being maintained, and these should at once be reported to the Department of Health. There should

be cooperation between the Department of School Inspection and the Bureau of Physical Education. Along these lines the health inspectors would find children in need of special exercise, particularly children with posture deformity, and they would refer such children to the Department of Physical Education for special corrective exercises; that the Department of Physical Education in their work would discover children with heart disease and organic defects that should be properly referred to the Department of Health Inspection, and between these two departments they could get up a series of corrective exercises which should be prescribed by one department or other to meet the conditions discovered in various pupils.

In the next place, there should be cooperation between the business departments of the school and health inspection department looking toward a better control of the hygiene of the school room. There must be control of the ventilation about which we know very little. We need a lot of information in addition to that which we now have. We will not begin to get that information effective until there can be much closer cooperation than there has been.

The hygiene of the schoolroom is under the immediate direction of the school janitors and school engineers at present. These things belong in the business office and that is where cooperation should be.

Another recommendation is that every child should have its mental capacity tested rather early in the course of the school period. It is a waste of time and of energy for a teacher to be engaged in teaching children who are unteachable, and a moderate percentage of children are relatively unteachable, because they are more or less feeble-minded or are deficient in some mental way.

Next, there should be a behavioristic survey of each school child. A child may be deficient mentally, and be harmless and inoffensive in the schoolroom. The child may be inoffensive amongst other pupils and not a source of trouble to the teacher by reason of contact. If a child is rated from a behavioristic standpoint, it saves difficulty for the teacher and difficulty for the schoolroom community.

We have pathological mentality and we have pathological behavior, and it is well that we should recognize both of these possibilities. There is logic in the science of behavior, if you please, and study would do much toward solving what seem now to be the unsolvable questions of behavior in a schoolroom. Of course, there has been a beginning. They have always marked pupils on account of deportment, which is a beginning of the markings of behavior, relating to a few phases of behavior but to only a few.

There should be more scientific study and treatment and care of pupils suffering from speech defects. More attention should be paid to the posture of school children. There should be a health and scholastic record card that will travel with a pupil from the time he enters school, thru the grades, thru the high school, etc. There is such a teacher's record at the present time. The record should be on the basis of the child as a unit, should travel with the child as it travels from room to room, from school to school, from grades thru high school over to the work of the examiner. If you follow this you will recognize it cannot be carried out unless there is some addition to the curriculum of the normal school. Some of the things the teachers must know about, some of the things that they must carry on, as well as being in touch with them they cannot learn very much about under the present arrangement. Therefore, there should be several additions to the curriculum of the normal school, and these suggestions

should begin with a course of instruction in various lines to the teachers in the normal school because an effort is made to put them in the schools themselves. And lastly, there should be certain changes made in the physical examination of the school children, what is ordinarily known as the physical.

We have had the opportunity of hearing a number of times from the Committee of the Chicago Dental Society. The plan they presented was that which was presented to the State Dental Society recently. They made an estimate of the total amount of work which should be done and the cost of that work, and as I intimated a while ago their estimate was that there should be an annual appropriation for this purpose of five hundred thousand dollars a year for a full program, and a smaller sum for a program to initiate the work.

It was the opinion of the committee, after considering all these various propositions, that dental hygiene was much more important than any other of the divisions of the physical examination. If you are acquainted with the physical examination, as made, you may remember that there are twenty odd terms on the card. It was our judgment that dental hygiene was more important than any one of them, and as important as any several of them combined. Our judgment was that one-third of the entire expenditure for medical school inspection should be for dental inspection and curative care. As we investigated the subject over the country we came to the conclusion that there was not much additional need for inspection. Every department from which we received a report reported that they found infinitely more than they were able to remedy.

I know that the dentists object to the inspection of teeth by medical men because they say there are more cavities than the medical men find, and that the statistics put out by medical inspectors show that 50 per cent of the children have dental caries are obviously incorrect; that the percentage is much higher than that. But we find everywhere a number of defects to be remedied, and remedial defects at that were very much larger than the number of defects remedied; that the need was for important curative procedures, remedial procedures rather than educational inspection service. Therefore, we recommended that there should be radical changes in the clinical provision and in the nursing service, since nurses are really auxiliaries to the curative rather than to the inspection end, and we find that is true in the dental end. Of course, the medical inspectors do not discover all or anywhere near all of the dental defects, but they discover a very much larger percentage than anybody has been able to get remedied, granting that medical inspection as it is, is imperfect.

Let us discuss the question of dental inspection. I read a report the other day by Sir Christopher Addison. As you know, in Great Britain they have a national health department with a cabinet officer, and that national health department is presided over by Sir Christopher Addison. You will find in the Dental Record for February of this year an account of a speech made by Sir Christopher Addison in which he refers to the dental aspects of school inspection. He says that in Great Britain there are but five thousand dentists; yet there are 5,750,000 school children, the great bulk of whom have teeth that need caring for.

What is the possibility of having all of the children cared for who need it if the work is limited to the dentists of the British Empire? If the dentists were to give over all of their work with adults and give their full time to filling the teeth of school children there would not be enough to fill these teeth. He made

another statement which impressed me very much, and that was that in Great Britain, out of 319 organized communities, with local government boards, provision for dental care of school children had been made in 169. I got the idea from his talk that that provision was in some degree adequate. If that is true, it is a very much better record than we have made in this country—169 communities out of 319. Of course, we recognize the need is much greater. Our school children, bad as their teeth are, have very much better teeth than the school children of Great Britain, particularly of Scotland. They seemed to have recognized the need quicker than we have, and they seem to have undertaken to meet the situation more properly than we have undertaken to meet it.

This phase of the subject was brought to my attention a number of years ago by Dr. Ottolengui, who called attention to the fact that there are not in this country, as well prepared as we are with the equipment to train dentists, enough dentists to fill all of the teeth of the school children if they were to give all their time to it, neglecting all other elements of society. That means, if we are ever to undertake a compelling program, we must have some machinery for doing the work in addition to the dental machinery as it is at the present time organized. I think we had better come to the conclusion that with respect to all branches of medicine, it is exceedingly wasteful to have the time of highly trained men and women given over to the doing of things that do not require their degree of training. That we must organize into groups; that we are compelled, if we look into the future at all, to recognize the necessity of group action in all branches of medicine. In these groups there must be men of high training to do highly specialized work, surrounded by other people less highly trained, and they in turn by still other people who are less highly trained. In that way you could get work done that does not require a high degree of training and done just as well or better than it can be done by means of the highest degree of skill. My branch of the medical profession has been slower to see that than you. Doctors go hungry when the community has low health standards. Elevate the standards of community health, of individual health in the community, and the result is dissatisfaction with conditions, and that means a greater demand for highly specialized medical service. Dentists go hungry when the people of the community have dirty, rotten mouths and do not care about it. The best way to stimulate dental work is to have mouths cleaned up and have everybody anxious to have his mouth in as good condition as the other fellow's mouth, and it will pay you to do it, even tho the work of dental cleaning up, dental hygiene, be done by dental hygienists or other auxiliaries of the dental profession. You have seen that much more clearly than the medical profession has. Therefore, no man who thinks on the subject can do other than approve the general program that was outlined before your meeting by Drs. Fones and Burkhart and other speakers before the Illinois State Dental Society.

My theme is a program for the community. I want you to disabuse your minds of the idea that the cleaning of the teeth, putting them in perfect condition, and the daily drill in brushing the teeth are going to prevent all decay, because I do not think it will. I should like to be present at a meeting some time when you discuss the relative advantage of the different methods of cleaning teeth. To be frank with you, I have not anywhere near the respect for the cleaning possibilities of the circular method of brushing teeth that Dr. Fones and some of you have. That is a techni-

cal question. Even tho we should fill all the teeth, we would discover that there are other factors in decay besides the matter of dirty mouths.

I would like to discuss some time the relation of sugar intake. I do not believe it is osmosis as Dr. Fones indicated in his remarks before the Illinois State Dental Society, but what we have in the mouth that is producing decay is free lactic acid. There cannot be any free lactic acid in the blood stream or lymph stream. However, in my judgment there is a lot in the argument of Dr. Fones, even tho the logic by which he works it out may not meet with my approval. We have been finding a good deal of blood sugar in the last few years, and it is not impossible that we may discover there is a variation in the amount of sugar in the saliva thrown off by the salivary glands from the blood stream, and that an excessive amount of blood sugar may mean an excessive amount of sugar or other derivatives of sugar in the saliva, just as it means an excessive amount of sugar in the urine and in other excretions. I am perfectly willing to go forward with Dr. Fones' program of regulating the amount of sugar that is to be fed to the average child. People eat sugar because of its properties as a condiment, not because of its food value and would be better off if children were fed less condiments of all kinds and less of the condiment by the name of sugar.

I have been much impressed with the propositions of Pickerell from which he advocates as a basic idea that there are essential differences in the structures of teeth, and that these essential differences in the structures of teeth are quite as largely responsible as a secondary factor for decay as the primary factor, the action of those organisms that bring about the reproduction of lactic acid.

I read a few days ago a book by the Englishman Dick, on "Housing in England," arguing for better housing. The basis of his argument was that poor housing brought about rickets, and the proof that he had of the wide development of rickets amongst school children was the condition of their teeth, and particularly the structure and composition of their teeth.

Again, I have read recently in a dental journal a communication from a Mrs. Mullenby of the relation of the fat soluble vitamin as an aid to the structure of teeth. All these things have a bearing on the other side of the question. We must in a comprehensive program take into account the structure of the teeth themselves, the diet and food of the individual or child, as well as the condition of the mouth itself. Having developed this, it does not mean I am opposed to the program of school inspection of the teeth and periodic cleaning of the teeth by the so-called hygienists, and daily cleaning of the teeth of the children in their homes. The fact that one factor is important does not mean the other is not.

That a program of so-called hygiene will not solve the question, does not mean that a program of so-called hygiene is not very important, or as important as any other factor as we see it.

The committee of the Board of Education had no hesitation in coming very briefly to the general program as outlined by your committee, of which Dr. Black is Chairman. They stand ready to do everything they can to secure the adoption of that program. They stand ready to help out in any way they can in getting for the school system of the City of Chicago, not only more dental clinics, more dental work than they have, but infinitely more; that it should be regarded from a standpoint entirely different from that which they have had when they have considered this question. We may be anxious to discuss certain details, and I am not at all cer-

tain but that it would be better to charge each school child a small fee for each cleaning service as well as for each filling service. That is one of the details to be taken up when we get the thing nearer solution than it now is. As the matter now stands, this report recommends dental inspection in the schools. It is ready to be made. We have the school superintendent intrenched in his position, and the school board intrenched in its position, and we very much hope that with your insistence and such aid as we may be able to lend to you, we will succeed in getting this report before the Superintendent and the School Board.

DISCUSSION.

P. A. Mortenson, Superintendent of the Schools of Chicago.

Just recently I secured from the present Board of Education authority for the appointment of a commission to undertake a very comprehensive study of certain problems related to education, such as fatigue, health, posture, malnutrition, oral hygiene in all its aspects, eye strain and other similar questions. It is the plan to have on this commission a group of the very best people it is possible to secure, those who are familiar with the medical aspects of the subjects, those who know something about the dental side, eye specialists and those who know most about physical training and its implications. We shall attempt with the assistance of these several specialists to give the above subjects a very careful and intensive study. I am sure the commission will avail itself of the work which Dr. Evans and his committee have already completed and which he has outlined to you this evening. At this point, I wish to assure you that so far as the Superintendent and the Board of Education are concerned, any constructive program that leads to better education, to the development of a better citizenship, better men to govern this nation and city and community tomorrow than we have today, will receive every possible support, and we shall cooperate with you in every constructive endeavor along these lines.

Education is a necessary precaution in a government such as ours where the outstanding public responsibility is that people be taught to choose leaders wisely. Our people must be taught the principles of government and some knowledge of the character and meaning of our institutions. Then, too, they need to have a better physical preparation for living a better physical development. With this comes in considerable measure a better moral tone and a better spiritual preparation for efficient citizenship.

We are inclined in educational circles to speak of the new education. Time does not permit a discussion of the new education except merely to suggest that in this newer education we have come to recognize that we are training not only minds, but that we must train for health also and must look after individuals' physical development. Clearly the citizen of tomorrow must be better qualified than he of yesterday, if the educators' task has been well done, not only mentally but morally and physically.

If I hear aright you have, too, a new dentistry. Not so many years ago dentists confined themselves too exclusively to the mechanical side of dentistry. It is entirely proper that there should be extractions and fillings, bridge and plate work, but there is another aspect which is, if anything, more important. I refer to preventive dental hygiene and the relation of dentistry to general medicine. Dentistry has come to be looked upon as a branch of medicine, and this implies for the dental profession a broader preparation, a wider field of available information, greater resourcefulness and a considerable familiarity with the

different phases of medical and scientific research as they are related to dentistry, if the dentist is to do his work most efficiently and effectively. I am pleased, therefore, to know that this society is interested in this new phase of dentistry. Preventive early prophylactics have been too long delayed.

With your permission I desire to refer for a moment to an experiment which was launched in our schools about two years ago. It is still in an experimental stage, but as such it has been valuable. A regularly qualified dentist was assigned to the schools to see what could be done to save the teeth of our children. First, the idea of really developing a knowledge of the proper use of toothbrushes and of teaching pupils to clean their teeth was worked out. This gave us some startling results. Feeling our way cautiously, this has expanded into a method for getting the bad mouth conditions of children actually improved by parents themselves thru the motivation of their children. It is always desirable to have children want to have their teeth sound and their mouths clean. Under this later scheme, the hygienist makes a record of the amount of caries and the mouth condition as regards cleanliness of every child in a classroom. For example, Johnny Jones' mouth condition may be given a rating of excellent; Mary Smith, that of fair only; Johnny Johnson, good; Robert Smith, bad, etc. Here, as elsewhere, it was believed that the best results could be gotten thru publicity. There is nothing in this rating especially new, except that these ratings of the mouth condition of all of the children in a classroom were copied upon a large score sheet and conspicuously posted in the classrooms. When Robert Smith saw his mouth condition posted as poor he became interested. He not only went at the teeth himself with the help of his parents, but he insisted that his parents seek out a dentist to rectify conditions. This plan, then, was to return a couple of months later and re-examine all the mouths of these children and post the records again. Our experience has been that a uniform improvement has resulted after each re-examination.

Nearly every child has taken care of his teeth and not only has there been a decided improvement in the cleanliness of the mouth but bad teeth have been repaired. This examination was again repeated two months later and the plan is to continue it from time to time. Up to the present, approximately sixty schools of the three hundred have been worked. Recently authority was granted by the Board of Education for the employment of two additional hygienists, but up to the present we have not been able to find those competent to take up the work. We are anxious that dentists have a sympathetic attitude toward our work in mouth hygiene, and we are hoping that we shall shortly find those who will be willing to go into this line of work with enthusiasm.

As you, doubtless, know we have been seriously handicapped by our financial situation. May we not bespeak your cooperation and that of other good citizens of Chicago to the end that more adequate financial provisions shall be made for our schools, so as to make possible an extension of dental hygiene and health instruction commensurate with their importance. The significance of a good mouth condition and good general health for education is fully recognized.

Dr. Evans has just referred to a pupil's record card which his committee suggested and which should contain not only a statement of the scholarship of the child but also of his behavior, his physical condition, and of his health. We are glad to say that this part of Dr. Evans' Committee's recommendation has been adopted and is being rapidly developed in our school system. Plans are

being perfected too to have this record card follow the pupil from room to room and from school to school, so that each new teacher may know at a glance the child's health record as well as what have been his scholarship and conduct. It is confidently expected that within a few months this plan will be in general use in the school system.

Until two or three years ago in Illinois, whenever a child desired to leave school and go to work, providing he was fourteen years of age and his parents consented, he was given a work permit. He then might take the permit which was always granted without any particular favor, to an employer and be steadily employed. On the other hand, there was nothing that would prevent his keeping it in his pocket, as a license to loaf. When hailed by a truant officer he would simply show his work certificate which made him exempt from interference. There was no way of strictly accounting for a boy under that system. We had no way of knowing whether he had gone to work, whether he had drifted back into some other school, or whether he was spending his time in the alleys as a member of some gang, shooting craps or doing worse.

To remedy this condition a few years ago, an amendment to the Child Labor law was secured, which makes the school certificate the property of the Board of Education. It has been tremendously valuable also from a health standpoint. Instead of giving the certificate to the child, it is now issued only to the employer. The boy or girl, who desires to go to work and who has gone far enough in school to satisfy the provisions of the law, is given a thoro examination as to his physical condition. He must be of proper weight, his tonsils and teeth must be in good condition and his eyes and ears must meet standard requirements, and if any of these are not in condition they must be made so before he is permitted to be employed. Again, many a boy or girl may go to work only in a specified institution, one for which his physical condition fits him. We must know where and at what he is to be employed. There are certain kinds of employment where a boy or girl will not be given a certificate to work. There are certain institutions in which one child may work, but another may not on account of his physical condition, and this the law permits us to regulate. When a boy or girl is no longer to be employed by a firm, the work certificate must be returned, under penalty, to the Board of Education and thus we can know where a boy or girl is and are able to follow up the case intelligently. My reason for referring to this is that you may clearly see that it gives us a very distinct advantage in caring for a child's physical and moral condition. For the first time in the history of our state can we say to a boy or girl, you must have your teeth put in proper condition; your tonsils must be taken care of, your eyes must be properly fitted with glasses, or you must reach a certain standard of weight and physical condition before you will be permitted to go to work or to change to a new job. It is unfortunate that we are not in a position to say this same thing of a child earlier in his school life, before he has attained the age of fourteen years. It is a fact, however, that the existence of this law has been a means of interesting parents in the health of their children before they reach the age of fourteen years, as it has become generally known that before a certificate to work can be secured children must be in good physical condition. Parents are likewise more sympathetic towards efforts that are made, at an earlier age, to bring about an improvement in children's physical condition.

I know you are vitally interested not alone in the health but also in the great problem of the general education of children. You are in a sense educators, too, because you look after certain phases of

education. You are in a sense, too, doing as much for education as those who are directly engaged in it, when it is thought of in its widest scope,—physical, moral, spiritual and mental.

There are, too, in the United States twenty millions of people directly engaged in education. One-fifth of the people in the city of Chicago are either teachers or students. Chicago's greatest asset is her boys and girls. Her greatest and most important business is education.

Arthur D. Black, Chicago.

The things which have been presented to us here tonight represent one of the most important problems before the American people today, the problem of child health. I have questioned many times as to whether child health is not more important than education, because most children who have good health get some kind of an education. But the child who has poor health is hopeless, even with an education.

Dr. Evans gave us a view of the whole problem of the physical development of the child in our public schools. He impressed the fact that the dental problem is only one of a considerable group, and must be fitted into its proper relation to all the others if the best results are to be attained. We all are tremendously pleased to know that Superintendent Mortenson is to appoint a commission of the type to which he has referred for the purpose of studying this problem.

Permit me to digress a moment from the main subject before us to say a word in reference to Dr. Evans' statement regarding sugar and its relation to the decay of teeth. In my opinion, the dental profession is not in general agreement with Dr. Fones on that point, and I would have liked it much better had that phase of the situation not been injected into the discussion before the Illinois State Dental Society.

The question of the structure of the teeth, which has been raised by Pickerell, goes back to the generally accepted belief of most men of some years ago. I think I give the general opinion of the thinking men of the dental profession today that the environment of a tooth rather than deviations in structure, is of supreme importance in connection with dental caries, and the saliva should have the most careful investigation in this connection.

What is our mouth hygiene problem in Chicago? I have tried to figure it out on somewhat the same basis that it has been figured out in England, as referred to by Dr. Evans. If we have 2,800,000 people in Chicago, there are about 600,000 under grade school age, that is, under six; another 600,000 that should be in the grade schools, possibly another 600,000 who are from high school age up to twenty-one, and a million over twenty-one. I will not refer to the group under six years of age, although we know that is where the teaching and training in dental hygiene should begin. Of that group of about 600,000 in the grade schools, taking Dr. Fones' figure of seven cavities per child on the average, there would be the little matter of 4,200,000 cavities. As was suggested for the condition in England, I am quite sure there are not enough dentists in the city of Chicago to properly care for the mouths of the children in the grade schools alone by the application of reparative dentistry, to say nothing of the children in the high schools, the million adults, and the children under grade school age.

If the radiographic studies of the mouths of adults which have been made show the average conditions, then of this million adults in Chicago there are more than 700,000, each of whom has at least one chronic focus of infection in his mouth. Is there any relation between the neglect in the teeth of the children in our public schools and this tremendously high percentage of chronic mouth infec-

tions in adults? I believe it is certain that there is a definite direct relationship between these two things. This should be the principal basis of our appeal for better care for the mouths of the children in our public schools—its effect on the health of these children when they grow to adult life.

I will not recite in detail the program that was presented to the Health Committee of the Board of Education. It covered: First, proper inspection of the mouths of the children in the public schools, as a part of the general physical inspection of the child. Second, the use of especially trained dental hygienists, about 250 being suggested as fairly adequate to teach mouth hygiene to the children and to give toothbrush drills. Third, a very considerable extension of our actual dispensary service in the public schools in order to take care of the mouths of those children who cannot afford to pay a dentist and who urgently need reparative service. Fourth, a system of records which would fit in with the general record system, to which both of the previous speakers have referred.

As the situation confronts us today, we are hopeless to cope with it, but as a result of our knowledge of what has been done in Bridgeport, Conn., under Dr. Fones' direction, we can hope that a few years of training in mouth hygiene and the general better care of their mouths by the children themselves will so reduce the number of cavities that it may be possible to arrange for reparative service sufficient for those who can not afford to pay.

As I have studied this problem of reparative dentistry in the public schools, and the effort that has been made in many cities, as well as in Chicago, I have come to the conclusion that we will never succeed along the lines which have been generally tried. The problem is so large that we can not cope with it as a profession, nor can we expect health departments or boards of education to appropriate enough money, even tho we had the men to give the service.

Let us think for a moment of three things: First, the possibility of preventing in a measure the occurrence of decay by the training of children in mouth hygiene. Please note that I say preventing, in a measure, because too many have said that dental hygiene measures will prevent decay, which I am sure they will not in more than a minority of cases. Second, the impossibilities of coping with the present situation in the schools, by reparative dentistry, and third, of what has been accomplished by institutions of the type of the Forsyth in Boston and the Eastman clinic in Rochester.

In considering the problem of reparative dentistry in Chicago, let us suppose we had any given number of dentists, say a hundred, for dispensary service scattered in a hundred different schools thruout the city; then suppose we had that same number of dentists grouped in three institutions like the Forsyth, one on the north side, one on the west side, and one on the south side; what would be the comparative value of the service those one hundred dentists would give, working as individual units or under direction in the three institutions? In the one case, the man is a unit to himself with nobody who can direct or control his actions or even know whether or not he is at work. On the other hand, there may be developed a definite system, with everything planned to get the greatest amount of service from the group of men cooperating under a single guiding hand. It is a problem of the service to be given by a number of individuals, and the grouping of dentists for reparative service in a few institutions which are thoroly equipped, will be infinitely more valuable than will an extension of the present type of service in our public schools.

There is another feature that should be borne in mind; suppose we have a

class of forty children in a single room of a school. Their teeth are examined, and of those who have been told their teeth should be filled, five are found to have parents who cannot afford to send them to a regular dentist. A social service worker has found out what each member of the family is earning and it has been determined that these children are entitled to charity service by the dentists in that school. The other thirty-five children know that; as a result, is there to be the line of cleavage established between them and the children who are given the benefit of charity in this, our most democratic of all institutions? With separate dental clinics, as at the Forsyth, a small charge of five or ten cents is made for each visit, no matter what service is given. This is done so that the idea of charity service may be lessened. In any event, the other children in the room do not need to know it if some of them go outside the public school for their dental service. It is an outside proposition, and this is a phase of the question worthy of consideration.

The problem for Chicago, as I see it, is this: As a profession, we should like to have inspection of our children as they enter the public schools. After that inspection has been made, the most important of all is adequate teaching of the children to take the best care of their mouths. We should emphasize as strongly as we can the possibilities of prevention. There should be the most adequate provision for the care of the mouths of those children whose parents cannot afford to pay for service, preferably outside of the school in a separate institution. This presents a tremendous opportunity to the dental profession of Chicago. Why should we not make this our problem? Why should we not, as servants of this community, as professional men of the community, take up more seriously than we have, the problem of doing our share in this great work of improving the physical condition of the younger children in our public schools?

Lastly, I want to make an appeal to the younger men who may have the opportunity to get into this service; I hope we will be able to find in the dental profession of Chicago a number of young men who have sufficient means, so that they can afford to put themselves into this service for a time without much regard of what the salary may be, but with the idea of making a great contribution to the welfare of the children of the next generation. (Applause.)

FIFTIETH ANNIVERSARY NEW JERSEY STATE DENTAL SOCIETY.

By RAYMONDE ADAIR ALBRAY, D. D. S., Newark, N. J.

THE New Jersey State Dental Society, for many years famous for its annual meetings, surpassed all previous events at the Fiftieth Anniversary Convention held at Atlantic City in July. An ideal convention city, famous the world over as America's Playground, unsurpassed hotels, wonderful bathing, and an unlimited variety of other amusements, accompanied by delightful weather conditions contributed full share toward making the gathering noteworthy.

The entire convention was held on Young's Million Dollar Pier, out over the ocean, swept by the cool sea breezes. With such a setting, it is small wonder that the efforts of those who arranged the convention were crowned with success.

Unsparing of their time and energy, the officers of the society and chairmen of the committees provided a program of great scientific interest, and that they succeeded in staging for the Golden Jubilee the finest meeting which the society has ever held, is a matter of history, and also something to be proud of and they have been heartily congratulated upon their accomplishment.

Dr. John C. Forsyth, President of the Society, had as his chief assistants Dr. S. I. Callahan, Vice President; Dr. F. K. Heazelton, Secretary; Dr. C. Faupel, Treasurer; Dr. W. H. Gelston, Convention Manager, Dr. W. W. Hodges, Chairman Essay Committee; Dr. Frank Manning, Chairman Clinic Committee; Dr. Albert Kerr, Chairman Exhibit Committee.

About two thousand dentists, many being from neighboring states and a number coming from greater distances, were in attendance, attracted no doubt by the opportunity offered of hearing and being taught by leaders of the profession who had been secured as essayists and clinicians.

Dr. John V. Conzett, President of the National Dental Association and famous as a teacher lectured upon "Cavity Preparation for the Reception of the Gold Inlay," illustrated with lantern slides. Dr. Conzett also conducted a three-day study course in gold inlay technic, which was a real treat for those who had been so fortunate as to secure membership in the class.

Dr. Edward C. Kirk, editor of the Dental Cosmos, gave an excellent lecture on "The Nervous Reflexes of Dentition," in which he called attention to disorders of the nervous system, having their inception in nerve irritations arising from pathological dental conditions.

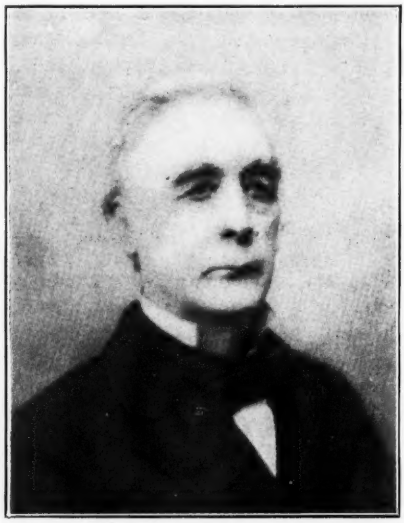
"Educating the American Dentist" was the topic of a paper by Dr. Otto U. King, Secretary of the National Dental Association and editor of The Journal of the National Dental Association. Dr.

King argued for a better and broader education for the student of dentistry, and for continued study and effort on the part of the practicing dentist to elevate himself and his profession.

Dr. Thomas B. Hartzell, of the University of Minnesota and the Research Institute of the National Dental Association, had chosen for his lecture "When to Extract and When to Conserve Diseased Teeth," and so important a subject could not have been intrusted to anyone more capable to handle it. Dr. Hartzell also conducted a study course of three days in which he demonstrated the principles of Prophylaxis and the Treatment of Pyorrhea. The members of the class were enthusiastic in their praise of the teacher and his methods.

"The Treatment of Ankylosis of the Jaws," was the topic of a lecture by Dr. W. Wayne Babcock, of Philadelphia, who, through his large surgical experience in hospital work in Philadelphia and in the army, was well qualified to present the subject, which he did in a most interesting manner.

Dr. Frederick K. Ream, of New York, was instructor in a course in Dental Radiography, which was well attended, giving demonstrations of the numerous processes involved in producing radiographs and their interpretation.



DR. J. HAYHURST
First President New Jersey State Dental Society, 1870-1871.

An innovation in the way of clinics was inaugurated and proved to be well worth while. The fourteen component societies of the New Jersey State Dental Society were invited to prepare Society Clinics and eight accepted and sent representatives. Dr. Forsyth had asked a committee to view each of these clinics

DR. JOHN C. FORSYTH
Fiftieth President New Jersey State Dental Society.

and judge them from the standpoints of practicability, scientific merit, and manner of presentation. This committee reported that the clinic of the Southern Dental Society of New Jersey, given by Drs. A. R. Slade, R. C. Clarke, D. A. Irwin, J. S. Owens, H. S. Clair, C. P. Tuttle, and W. H. Gelston was their choice and President Forsyth presented the Society with a handsome gavel as a token of appreciation.

The other component Societies which gave clinics were the Clinical Club of New Jersey, Hudson County Dental Society, Middlesex Dental Society, Passaic County Dental Society, Plainfield Dental Society, Tri-County Dental Society, Union County Dental Society.

Other clinics of interest were on the program and proved to be of exceptional merit.

The Clinic Club of Philadelpha, under the direction of Dr. W. S. Robinson, gave a progressive Clinic showing removable and stationary restorations with attachments permitting conservation of the pulp and tooth.

In his President's address, Dr. Forsyth reviewed briefly the history of the Society and its progress from a group of twenty members to about eight hundred, over a hundred and fifty having joined during the past year.

Dr. James I. Woolverton, chairman of the Legislative Committee, reported that the effort of the society to secure the passage of a bill to exempt dentists in the state from jury duty had finally been successful.

Any notice of this convention would be incomplete without reference to the exhibits, this feature being especially attractive. Nearly one hundred Dental Manufacturing and Specialty firms competing with each other in an effort to have the most attractive showing. Machinery Hall, where the exhibit was held was beautifully decorated, and the showing of materials, equipment, and the like particularly pleasing.

The officers elected for the coming year were:

Dr. S. I. Callahan, President.
Dr. W. W. Hodges, Vice President.
Dr. F. K. Heazelton, Secretary.
Dr. Chas. Faupel, Treasurer.

THE JOURNAL of the NATIONAL DENTAL ASSOCIATION

Entered as second-class matter, March 22, 1915, at the Post Office at Huntington, Indiana, under the Act of August 24, 1912. Published Monthly.

Editor and General Manager,
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All expressions of opinion and all statements of supposed facts are published on the authority of the writer over whose signature they appear and are not to be regarded as expressing the views of the National Dental Association, unless such statements or opinions have been adopted by vote of the Association.

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SUBSCRIPTION included in the annual membership dues.

SUBSCRIPTION, $2.00 a year, in advance, to non-members, living in all parts of the United States or its possessions. Canada, $2.75. Foreign countries, $3.00. Single copies, 25 cents.

ADVERTISEMENTS accepted only from reliable firms. Fraudulent and misleading advertisements barred.

IN CHANGES OF ADDRESS both the old and new address must be given.

JOURNALS are not sent beyond the subscription period.

VOL. 7 DECEMBER, 1920 NO. 12

Editorial Department.

A Merry Christmas to You
Kindly Contribute for the Christmas Seals

THE SPIRIT OF THE DAY "DO GOOD AND DISTRIBUTE"

We have in our great national body, men who have given their time, sacrificed their home life, in fact their lives, for the advancement of the cause of dentistry. Some of these men have traveled over the country, giving lectures before various dental societies, without having either their traveling or hotel expenses paid. These men who have done pioneer

work in dentistry, the men who laid the foundation for the dentistry we are enjoying today, should not be left in their declining days to a cruel world, compelled to spend their time in public charity institutions.

The wife of one of these pioneer dentists is going from house to house in one of our large cities selling vegetables. Her husband died a few years ago. He contributed many original articles that undoubtedly helped forward the cause of dentistry. He also was the author of one of our dental textbooks. This man was a real forerunner to modern dentistry for he appeared before dental societies for over forty years, in fact, he gave his very life's blood for the improvement of dentistry, without any thought of compensation. Other men are at present absorbed in great dental research problems, the solution of which will help very materially in furthering scientific dentistry. While these patriotic scientists are giving their best for dentistry and humanity, they are unable to make adequate provision for the proverbial rainy day. Since a non-productive period must come into our lives, accompanied perhaps by financial stress, why should not every member of the dental profession, while he is able, gladly and willingly contribute at least one dollar a year to this noble cause? We should say it with flowers while these men are still living. But if we have neglected to discharge our bounden duty to those men who have done so much for dentistry, we should then be in a position to say it with dollars to those who are left to carry on the burdens of the family's existence.

The dental profession should be financially prepared to take care of its loyal members who meet with a San Francisco earthquake and fire, a Galveston flood, or a Halifax disaster. No one knows when a wreck, explosion, accident, or great financial calamity may befall us—something which may take even the most frugal unaware, leaving us maimed and financially stranded, without any visible means of support for ourselves or families. A little assistance from our Relief Fund will be of inestimable value to some of the indigent members of our profession who may have lost their all. And surely one dollar is a very small sum for an annual contribution to such a worthy cause.

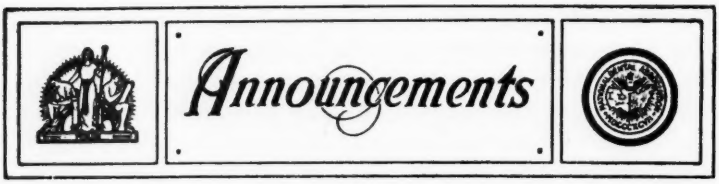
We are gratified with the fine spirit manifested this year and the unusually large contributions made, thus far, to this fund. Thousands of dollars have already been received thru the sale of Christmas seals, so that we ought to reach a total of $75,000 this year. We now have nearly $60,000 in this fund. However, it is not the size nor amount of the gift that counts—it is the spirit that prompts the giving, the desire to share the good things of life with others who have them not.

During the war we were asked to "give until it hurts." We are

not asking for that kind of giving this Christmas—rather we would ask that you give until it pleases. Give yourself a good time this Christmas by being a real, good fellow, by seeing the happiness you can bring into the drab lives of the needy ones in our profession. After all, there is a great deal more joy in doing something for others who otherwise might be forgotten than in having a great deal done for ourselves—**do good and distribute!**

CHRISTMAS AGAIN

Christmas again, with its peace and good will and wonder! How friends increase and multiply in value as the Day of days draws near. How the touch of human hands thrills us, and the look in human eyes! To our surprise we are not ashamed to be good, to be kind, to be loving. For this little space out of the long, selfish year we are glad to be ourselves. We give freely of our love, we offer our labor without price, and we speak kindly words that are rarer than rubies. Once more we take courage and let our hearts have their way, and life laughs and is glad. When Christmas comes the world suddenly grows better; sin less lovely and Heaven nearer; and all because a Little Boy was born in Bethlehem. Perhaps—who knows?—we might carry with us thruout the year the joy of this Christmas Living.—*Phillips Brooks.*



AMERICAN INSTITUTE OF DENTAL TEACHERS.

The next annual meeting of the American Institute of Dental Teachers will be held at the Claypool Hotel, Indianapolis, Ind., January 24th, 25th and 26th, 1921.

The program will contain much of interest in dental teaching methods and dental educational affairs. A cordial invitation is extended to all ethical practitioners and others interested along these lines to attend the sessions.

DR. ARTHUR D. BLACK, President.
DR. ABRAM HOFFMAN, Secretary,
381 Linwood Ave., Buffalo, N. Y.

ALPHA OMEGA DENTAL FRATERNITY.

The Alpha Omega Dental Fraternity will meet in convention at Baltimore, Md., on December 28, 29, 30, 1920. For full information, address Dr. S. H. Bomenblit, Supreme Scribe, 2459 No. 16th St., Philadelphia, Pa.

IOWA STATE DENTAL BOARD.

The Iowa State Board of Dental Examiners will meet for the purpose of examining candidates for a license to practice in Iowa, at Iowa City, College of Dentistry, beginning Monday, February 7, 1921, 9:00 A. M.

For further information and application blanks, address,

DR. C. B. MILLER, Sec'y,
726 Fleming Bldg., Des Moines, Iowa.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the North Carolina State Board of Dental Examiners will be held at Greensboro, N. C., beginning promptly at 9:00 o'clock on Thursday morning, January 6th, 1921.

For further information and application blank, address

DR. F. L. HUNT, Sec'y,
Asheville, N. C.

DELAWARE STATE BOARD OF DENTAL EXAMINERS.

The Delaware State Board of Dental Examiners will hold their next examination in Wilmington, Delaware, Municipal building, 10th and King Streets, January 12th and 13th. For further information apply to,

W. S. P. COMBS, Sec'y,
Middletown, Delaware.

NEW MEXICO BOARD OF DENTAL EXAMINERS.

The New Mexico Board of Dental Examiners will hold a meeting in Albuquerque, beginning February 7th, 1921, for the examination of applicants. All applicants must take the examination. For blanks and rules governing examination address,

M. J. MORAN, Secretary,
Deming, New Mexico.

MONTANA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the Montana State Board of Dental Examiners will be held in Helena, beginning the second Monday in January. Applications must be in the hands of the Secretary not later than January 1st.

For further information, apply to

FRANK J. BELL, Secretary,
Box 425, Billings, Montana.

THE ST. LOUIS STUDY CLUB, ST. LOUIS, MISSOURI.

The St. Louis Study Club announces its third annual midwinter clinic to be held in St. Louis at the American Hotel Annex, on January 15, 1921, from 2:00 to 5:00 P. M. At this clinic will be shown the results of the work accomplished during the session just closing. Following the clinic at 6:30 P. M. a dinner will be given in honor of the instructors.

All ethical dentists are invited to attend.

J. F. ALCORN, Secretary.

THE DETROIT DENTAL CLINIC CLUB SCHOOL OF POST-GRADUATE INSTRUCTION.

(For Practitioners Only).

Arrangements have been completed for the organization and conduct of a *Post-Graduate School.* This step was made necessary because of the demand upon this club and its members for instruction, by the profession.

The teaching staff embraces men prominent in their respective branches.

All courses are *practical* and include work in the infirmary and laboratories under supervision of the Staff of Instructors.

This club was formed in 1915 by the dentists of Detroit and vicinity who believed that such a club would be a very great asset to dentists in Michigan, in promoting mutual improvement, social intercourse and good feeling.

It was decided that the executive council should consist of a president, vice-president, secretary, treasurer, and board of directors, the latter to consist of the chairmen of the sections having the various phases of dentistry under study. Great care was exercised in the selection of officers. No man was elected who did not have a long record of unselfish service for dental progress. The men who were elected when the club was organized are working harder than ever for the welfare of the club and dentistry in general, which, of course, proves that the organization was sound and that the plan of properly managed study clubs is worth while.

The membership requirements from a professional standpoint were demonstrations of ability in some branch of dentistry to meet the standards maintained by the club, either by participating in its activities or in those of other recognized dental organizations.

The club has over sixty members composed of such men and women. So many requests have been made from dental societies outside of Michigan for the services of the club that it has been impossible to grant them. The last visit of the club, which was to the Bronx dental meeting in New York, cost about $27,000, and as it is impractical for all of the members to leave their practices at one time, even if the expenses could be met, the club has decided to open a postgraduate school in order to utilize its potency for the progress of dentistry.

This plan will make it possible for state and local societies to delegate selected members to enrol for any or all of the courses of instruction to be given, in order that they may return home and present to their society the fund of information which it has taken the sixty members of the Detroit Dental Club over five years of hard work to acquire. In addition, it is expected that individual dentists will also take advantage of the opportunity to gain this knowledge at the minimum cost.

The following graduate courses are offered: Denture Construction, Crown and Bridge, Preventive Dentistry, Oral Surgery and Local Anesthesia, Indirect Method for Gold and Porcelain Inlay and Crown Construction, Porcelain Restorations. The club also expects to add, in the near future, sections on Orthodontia, Care of Pulpless Teeth, and Dental Economics. All money received for tuition will be utilized solely for the purpose of improving the facilities of the club, as the members will not receive any remuneration for their services other than the satisfaction of improving themselves in dentistry and assisting a worthy plan—to improve the oral conditions of the human race.

All applicants must be members in good standing of their respective State Society.

For further information, address

THE SECRETARY,
Detroit Dental Clinic Club,
704 Fine Arts Building, Detroit, Mich.

CENTRAL DENTAL ASSOCIATION OF NEW JERSEY.

The Central Dental Association of Northern New Jersey will hold a mid-winter educational meeting at the Robert Treat Hotel, Newark, New Jersey, during the first week in March. All the prominent dental manufacturers and dealers will exhibit. The clinicians and essayists will be from among the best in the country, and the meeting promises to be one of the most successful and largest attended ever held in Northern New Jersey. Further notices of the exact time and the names of the men who will clinic, and the program complete will appear in later issues of this publication.

HENRY J. GIBBINS, D.D.S.,
Chairman Executive Committee,
221 S. Orange Ave., Newark, N. J.

NAVAL DENTAL CORPS EXAMINATIONS.

Examinations have been ordered by Surgeon General Braisted to be held in Washington on January 17, 1921, for the purpose of making appointments in the naval dental corps. There will be thirty vacancies to be filled in the regular permanent dental corps of the Navy, and every candidate who qualifies in the examination within the 30 standing highest will be commissioned. No temporary appointments are to be made as a result of this competition. The requirements as to age, professional qualifications, etc., may be ascertained by inquiry at the bureau of medicine and surgery, Navy Department.—*Army and Navy Register,* Nov. 30.

CHICAGO DENTAL SOCIETY

ANNUAL CLINIC AND MOUTH HYGIENE MEETING
CONGRESS HOTEL, JANUARY 27, 28, 29, 1921

Dear Doctor: You are cordially invited to attend our Annual Clinic and meeting. This preliminary notice of the program is sent for your convenience that you may reserve the days and make your reservation for hotel accommodations.

THURSDAY, JANUARY 27, 1921—ANNUAL CLINIC DAY

9:00 A. M.

Registration and distribution of clinic tickets.

9:30 A. M. to 11:30 A. M. and 2:30 P. M. to 4:30 P. M.

Twelve unit clinics and lecture clinics for intensive study. Clinics in separate rooms continuous to one group entire day. Lecture, lantern slides, charts and models, and table demonstration. Entrance by ticket only, limited to one hundred in group.

SUBJECTS AND CLINICIANS

		Morning 9:30 to 11:30	Afternoon 2:30 to 4:30
1.	Clasp and Saddle Construction	F. E. Roach G. W. Dittmar	F. E. Roach G. W. Dittmar
2.	Impression, Model Construction, and Obtaining Bite	J. H. Hosper	R. R. Blanchard (Springfield).
3.	Arrangement and Articulation of Teeth and Finishing the Case	R. E. Hall John LaDue	R. E. Hall John LaDue
4.	Jacket and Shoulder Crowns	George Thompson S. D. Tylman	George Thompson S. D. Tylman
5.	Gold Inlays	Northwestern University Unit Clinic	Clinic repeated in afternoon
6.	Radiography, Interpretation, and Diagnosis of Mouth Condition	J. H. Prothero	F. F. Molt
7.	Root-Canal Operations	F. W. Gethro	J. R. Blayney
8.	Pyorrhea and Prophylaxis		F. H. Skinner
9.	Histology and Pathology of Peridental Membrane	F. B. Noyes Newton G. Thomas	W. G. Skillen
10.	Elimination of Pyorrhea Pockets	Arthur D. Black F. W. Merrifield	
11.	Local and Conductive Anesthesia	A. E. Smith	A. E. Smith
12.	Surgical Clinics	F. B. Moorehead, Louis Schultz	W. H. G. Logan P. G. Puterbaugh Thomas L. Gilmer H. A. Potts
13.	Extraction Clinics	Charles Freeman	F. J. Bernard D. M. Hodgman

Where the same clinicians appear both morning and afternoon the clinic will require both periods to complete the instruction; hence only one complete clinic may be seen. Where different clinicians appear in the afternoon the guest may see one complete clinic in the morning and another in the afternoon.

11:30 A. M. to 2:30 P. M.

Manufacturers' Exhibit.

7:00 P. M.

1. Motion Pictures.
2. Paper: "Focal Infection in Relation to General Health," Ernest E. Irons (M. D.), Chicago (medical profession invited).

FRIDAY, JANUARY 28, 1921—MOUTH HYGIENE DAY

9:30 A. M. to 11:30 A. M.

Clinics demonstrating care of children's teeth, by dental hygienist from: (1) Forsyth Infirmary, Boston, Massachusetts; (2) Rochester Dispensary, Rochester, New York; (3) Bridgeport Public School Service, Bridgeport, Connecticut; (4) Des Moines (Iowa) Mouth Hygiene Technic; (5) Chicago (Illinois) Public School Service; (6) Columbia University Hygienist School.

1:30 P. M. to 3:30 P. M.

Friday morning clinics repeated for school teachers, public officials, and public.

1:30 P. M. to 3:30 P. M.

1. Motion Pictures.
2. Paper: "Relation of Diet to Mouth Hygiene," Wallace Secombe, Toronto, Canada.
3. Manufacturers' Exhibit.

3:30 P. M. to 5:00 P. M.

Public Meeting—*Auditorium Hotel Theater.*

Organ Recital.

1. Motion Pictures.
2. "Child Health in Relation to Adult Health," William A. Evans (M. D.), Health Editor, Chicago, Illinois.
3. "Care of the Teeth of School Children," Albert C. Fones, Bridgeport, Connecticut.

6:30 P. M.

Annual Banquet in Honor of Thomas Forsyth, Boston, Massachusetts

(Special Invitation to Ladies)

Speakers: H. E. Friesell, President National Dental Association, Pittsburgh, Pennsylvania; G. S. Millberry, Dean, Dental Department of University of California, San Francisco; Peter Mortenson, Superintendent of Chicago Public Schools; Timothy Leary, Forsyth Institute, Boston, Massachusetts; H. J. Burkhart, Rochester Dispensary, Rochester, New York; A. W. Thornton, Dean, Dental Department, Magill University, Montreal, Canada.

SATURDAY, JANUARY 29, 1921—GENERAL CLINIC DAY

9:30 A. M. to 1:00 P. M.

1. General Clinic:
   (1) Selected clinics from about thirty-five neighboring state and district societies.
   (2) Clinics by dental colleges represented at annual meeting of Institute of Dental Teachers.
   (3) Clinics by about fifty local dentists on advanced methods of technical procedure.
2. Manufacturers' Exhibit.

Dr. M. M. Printz, 25 E. Washington St., Chicago, Ill.

Dear Dr. Printz: Please reserve a ticket for me for January 27, 1921, for the clinic on .....or if that is filled my next choice is.....

Yours very truly,

Please fill out and return.

SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the South Dakota State Board of Dental Examiners will be held in Sioux Falls, South Dakota, January 11th, 12th, 13th and 14th, 1921, beginning promptly at 9:00 A. M., January 11th.

All applications must be in the hands of the Secretary by January 1st. Fee for examination, $25.00. No reciprocity or interchange. Full information and application blanks may be received by addressing

L. R. WALSTON, Secretary,
Redfield, So. Dak.

IDAHO DENTAL EXAMINATION.

The next examination for dentists will be held in this office on January 11, 1921. For application blank and law pertaining to this profession, address Bureau of License, Boise, Idaho.

PAUL DAVIS, Director.

DENTAL CORPS ORDERS FROM WAR DEPARTMENT.

Maj. Benjamin J. Durham to Walter Reed General Hospital, D. C., for observation and treatment.

—*Army and Navy Register, October 30, 1920.*

Lieut. Col. Harold O. Scott from duties at Fort Leavenworth, Kans., to New York City and about December 6 to Coblenz, Germany, for duty.

Maj. James L. P. Irwin from duty at Fort Wordon, Wash., to 8th corps area for duty.

—*Army and Navy Register, November 13, 1920.*

The following are honorably discharged:

Maj. Richard F. Doran, Capts. Charles E. Prange, Clarence A. Flanagan, 1st Lieuts. Clarence E. Wiscup, Henry L. Gilmour, Jr.

Col. Frank H. Wolven, having been found by an Army retiring board incapacitated for active srevice on account of physical disability incident thereto, his retirement from active service is announced; proceed home.

—*Army and Navy Register, November 27, 1920.*

The War Department on November 27 announced the following appointments as commissioned officers in the Regular Army:

Dental Corps.

Captain.

Charles B. Amis, Camp Travis, Texas.

First Lieutenants.

William J. Adlington, Main St., Winterport, Maine.

Clarence R. Benney, Fort Rosecrans, Calif.

John C. Burr, 17 North St., Middletown, N. Y.

Lawrence P. Busby, Jr., Bee Bldg., Memphis, Tenn.

Chas. E. Callery, 1340 Randolph St. N. W., Washington.

Leon A. Jones, 3314 Lawrence Ave., Chicago, Ill.

Walter D. Kells, 520 Beacon St., Boston, Mass.

James B. Mockbee, Fort McDowell, Calif.

Clarence C. Olson, 2617 E. 22d St., Minneapolis, Minn.

Stanley R. Rayman, U. S. P. H. S., Biltmore, N. C.

John L. Richards, Box 515, Ancon, Canal Zone.

Chauncey DeW. Van Alstine, Plattsburg, N. Y.

Appointments of commissioned officers announced on November 29:

First Lieutenants.

Frederick Vater, 1160 27th St., Milwaukee, Wis.

Henry A. Winslow, recruit depot, Ft. Slocum, N. Y.

1st Lieut. Charles E. Callery from duty at office of surgeon general to Hoboken, N. J., transport service for duty.

Resignation by Capt. Frank P. K. Barker accepted.

The following are honorably discharged:

Majs. Joseph D. Eby, Francis J. Rogers, Capts. LeRoy W. Swartz, Joseph P. Collins, 1st Lieuts. Paul Trnavsky, Jr., Earl Stafford, William H. McDonald, George W. Riche, James W. Young, Arthur F. Bokman, George E. Pendarvis.

—*Army and Navy Register, December 4, 1920.*

PATENTS OF INTEREST TO DENTISTS.

1327306, Tooth-shade guide, Isadore S. Berger, New York, N. Y.

1327149, Reservoir broach, DeLloyd O. Duncan, Rockford, Ill.

1327477, Dental hand port-polisher, James W. Ivory, Philadelphia, Pa.

1327114, Gage for dental and surgical instruments, Meyer L. Rhein, New York, N. Y.

1327807, Toothbrush, Paul M. Burleigh, Omaha, Nebr.

1328131, Dental instrument, Frank E. Davis, Erie, Pa.

1327737, Rubber toothbrush, Wm. J. Eggers, Brooklyn, N. Y.

1327674, Denture, Charlotte Hinchey, Buffalo, N. Y.

1328095, Rotary shaft and coupling for electric dental engines, Alfred P. Morrill, San Diego, Cal.

1328351, Mold for molding artificial teeth, George H. Whiteley, Jr., York, Pa.

1329274, Dental tool, Perry R. Skinner, Amsterdam, N. Y.

Copies of above patents may be obtained for twenty-five cents each, by addressing John A. Saul, Solicitor of Patents, Fendell Building, Washington, D. C.

KOLYNOS

DENTAL CREAM

Soap when mixed with water hydrolyzes, producing various chemical products which can unite with fatty acids forming new soap. When washing your hands with soap this chemical reaction occurs, removing the fat and dirt from the surfaces.

Kolynos contains soap and when used on the dry brush slowly hydrolyzes as it mixes with the saliva. This gradual formation of foam assists in cleaning the teeth.

Convince yourself by requesting a professional package of Kolynos Dental Cream which will be forwarded charges prepaid.

THE KOLYNOS COMPANY

NEW HAVEN, CONN.

SINCE it is an established fact that oral filth and infections of the peridental structures hold a causal relation to many systemic diseases, it follows that the dentist, with the physician, often finds it necessary to *insist* that the teeth be kept clean.

On these occasions, Colgate's Ribbon Dental Cream doubtless comes to his mind because of its intrinsic merit as a dental detergent. He may also find satisfaction in specifying Colgate's, because it stands in such sharp contrast to the mass of tooth pastes for which wholly unwarranted remedial claims are made.

Ney-Gold

ALL golds prepared for dental uses are not the same in working properties. Integrity of manufacture is important. The processes help to determine the properties.

The policy of this company requires specific values and specific properties in all products at all times.

Anything short of the best for a professional man results in a degradation of workmanship. There is no half-way station. Juggling with gold prices to save expense is always an expensive proposition.

Ney-Gold

in any form is exactly what it is represented to be. It is manufactured not merely to sell, but to meet a distinct professional requirement.

IF YOUR DEALER CANNOT SUPPLY ANY ARTICLE OF OUR MANUFACTURE, WRITE TO US

THE PIONEER

THE LATE JOHN M. NEY

The J. M. NEY COMPANY

FOUNDED IN 1812

President

HARTFORD CONNECTICUT, U.S.A.

NEW GOLD FOR PRECIOUS METAL PRODUCTS

OLD GOLD, SILVER PLATINUM ETC.

SERVICE

The data gathered by the X-Ray Department at Rochester is available at all times to interested Roentgenologists. It is hoped that you will feel free to call on us for such help as we can give in your problems.

EASTMAN KODAK COMPANY

ROCHESTER, N. Y.

What does dead-burned mean?

CEMENT powder can be *dead-burned* by faulty calcination. Reaction with the liquid then becomes sluggish and lifeless. The cement goes into the mouth overloaded with weak, dead-burned waste

◆

CAULK CEMENT

is all live and reactive. Every atom in the bottle is genuine cementing material

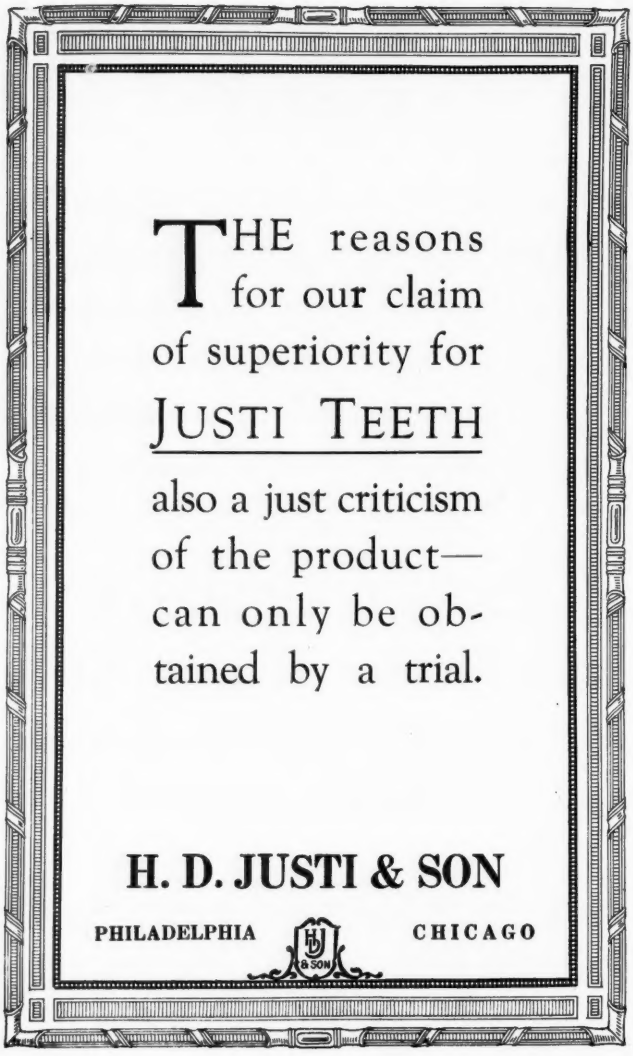
◆

GIVE YOUR PATIENTS THE BENEFIT

Adopt Caulk Cement for your practice

Sold by all dealers

THE L. D. CAULK COMPANY : MILFORD, DELAWARE : TORONTO, CANADA


THE reasons
for our claim
of superiority for
JUSTI TEETH
also a just criticism
of the product—
can only be ob-
tained by a trial.
H. D. JUSTI & SON
PHILADELPHIA
CHICAGO

Just Say

White's 1400 Assortment
of
Paper Disks

YOU will receive a carefully selected assortment of good disks; all usable grits in desirable sizes. We make up the quantities and variety from a knowledge of their comparative popularity and usefulness.

Paper disks are among the inexpensive items that are used in great numbers, but for the very reason of their extensive use they should be as good as possible—which means they should be perfectly circular, without ragged edges, with holes accurately centered, and with grit that "stays on."

Don't waste effort and time on poor disks, especially when efficient disks may be had for little money.

S. S. White Paper Disks

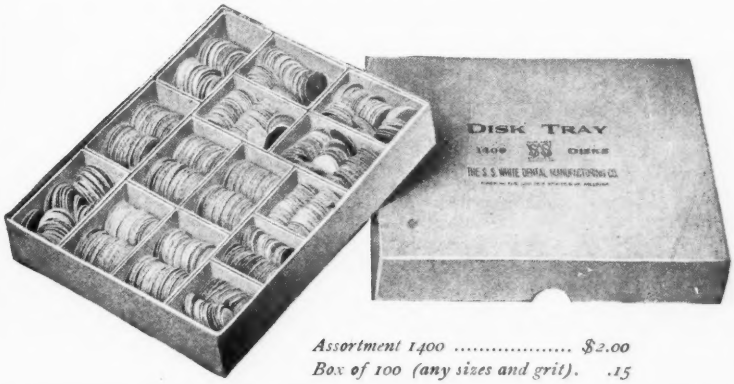
Your Dealers Will Supply You

The S. S. White Dental Mfg. Co.

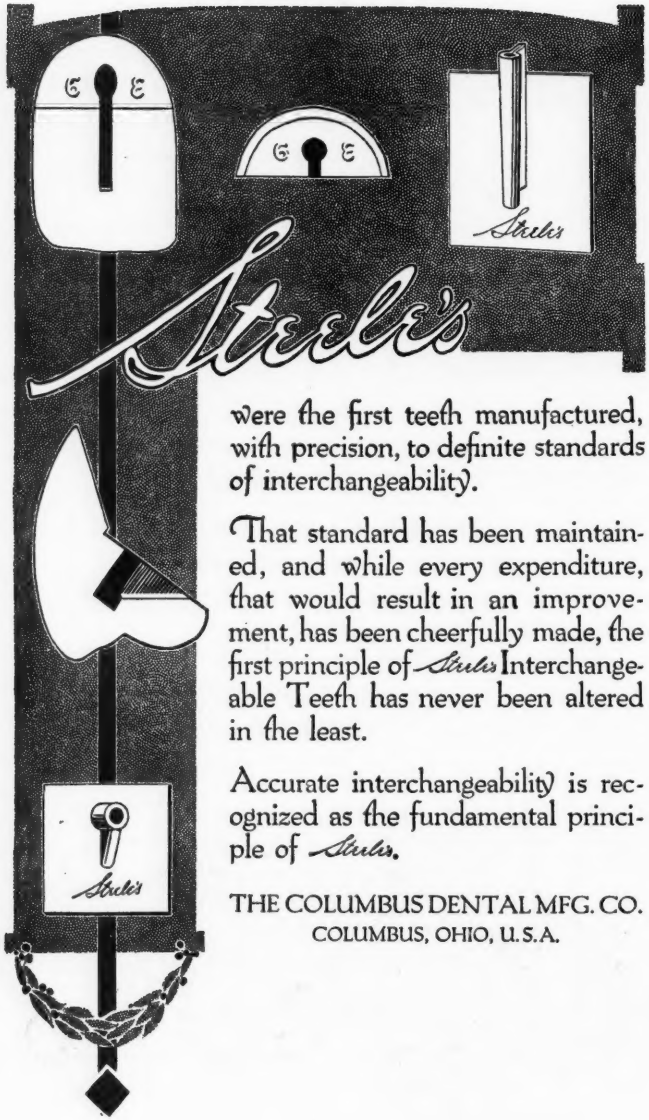
"Since 1844 the Standard"

Philadelphia

Send for handsome sample card of Disks and Strips



Assortment 1400 ..... $2.00
Box of 100 (any sizes and grit). .15



were the first teeth manufactured, with precision, to definite standards of interchangeability.

That standard has been maintained, and while every expenditure, that would result in an improvement, has been cheerfully made, the first principle of *Steele's* Interchangeable Teeth has never been altered in the least.

Accurate interchangeability is recognized as the fundamental principle of *Steele's*.

THE COLUMBUS DENTAL MFG. CO.
COLUMBUS, OHIO, U.S.A.

CHAMPION RIBBON FLOSS

Waxed and coated with fine Abrasive Powder.

Undoubtedly the best for Prophylactic Work.

Champion Ribbon Floss (3 widths, abrasive) will not injure the enamel—being silk it will not lacerate the gums.

Use this scientific and efficient Ribbon Floss.

GUDEBROD BROS. SILK CO.

Suc. to

Cutter Silk Mfg. Co.

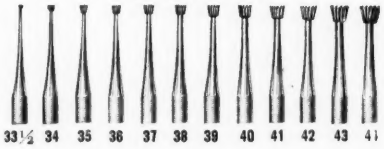
603 CHESTNUT ST., PHILADELPHIA, PA.

Quantity Rates On CLEV-DENT BURS

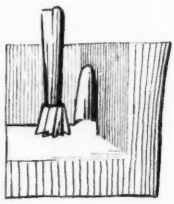
Round

A Clev-Dent Round Bur is shown here in the use for which it is best adapted, opening a pit cavity. The smaller sizes of these burs are most effective. They run more smoothly and cause less pain.

Inverted Cone



Inverted Cone Burs are among the most generally useful forms made. This one is forming a convenience point for starting a gold foil restoration.



Prices of CLEV-DENT BURS have recently been reduced almost to the pre-war basis. The various quantity rates, half-gross, one, two, and three gross, and the Complete Assortment are particularly attractive.

At the **one gross rate,** for instance, Clev-Dent Burs are $1.00 and $1.25 per dozen.

At the **three gross rate,** these accurate, clean cutting, and carefully tempered instruments may be purchased for $.84 and $1.09 per dozen.

The COMPLETE ASSORTMENT includes one gross of cross-cut enamel burs and two gross of excavating burs with an all-metal, sterilizable bur case. The price is $33, an average of $.92 per dozen for the burs and no extra charge for the case.

Complete Catalog of Dental Engine Equipment with prices and quantity rates sent on request

THE CLEVELAND DENTAL MFG. CO.

CLEVELAND, OHIO, U. S. A.

Is Your Daytime Home Attractive?

THE home where you spend the time when not engaged in the office is made as attractive and as beautiful as your circumstances permit.

How about the office? That is your home the greater part of every day.

Make it a pleasant place in which to work, with surroundings inviting to your patients. You will notice the effect on your practice quickly, you will have a new attitude toward your work.

Equipment and the harmonizing background that should go with it, is the most important part of the appearance of your office. We have been assisting Dentists with their office problems for twenty-five years. Let us help you with yours. Literature upon request.

The Ritter Way is the Better Way

RITTER DENTAL MFG. CO., INC.

General Office and Factory

ROCHESTER, N. Y.

Branch Offices and Display Rooms

New York Philadelphia Chicago

Kansas City Boston Detroit San Francisco

Why Patients Thank You *for Prescribing* ANACIN

250 TABLETS
ANACIN
ANACIN
Anodyne Compound
AN ANODYNE FEBRIFUGE SEDATIVE WITH ANTI-RHEUMATIC AND ANTI-NEURALGIC ACTION.
NON-DEPRESSENT
NON-NARCOTIC
ADULT DOSAGE
For Headache, Toothache, Earache, Neuralgia, Neuritis, After-extraction Pains, ONE or TWO Tablets first depending on the severity of the pain followed by ONE Tablet per hour, if necessary, until relieved.
For Colds, La-Grippe, Influenza and Rheumatic Pains, ONE Tablet every two or three hours until relieved.
THE HEIDBRINK COMPANY
MINNEAPOLIS MINNESOTA
The Manufacturer

BECAUSE:
ANACIN quiets after-extraction pains quickly—surely—yet

Does **not** depress even heart cases, because of its **balanced** ingredients.

Thousands of dentists now use this **safe** anodyne compound in daily practice. Write us for samples of ANACIN.

THE HEIDBRINK COMPANY

MINNEAPOLIS, MINN.
Dept. G

TRADE MARK CONTROL SAFETY ECONOMY EFFICIENCY

Cut out the "Ifs, Ands, and Buts" of Anesthesia

THE Heidbrink Gas Machine converts anesthesia into a matter of simple routine. It replaces uncertainty with absolute confidence, and protects the dentist, the assistant and the patient.

Heidbrink universal dosage (proven correct in 90% of cases by thousands of clinical tests) is precisely delivered and automatically maintained by this machine. Special cases are met by simple dosage adjustments.

Clinical records and full information on request. Address your dealer or write us direct.

THE HEIDBRINK COMPANY

MINNEAPOLIS, MINN.
Dept. B

TRADE CONTROL SAFETY MARK ECONOMY AA EFFICIENCY

Positive Results Assured

When You Use

L-F Coolidge X-Ray Units

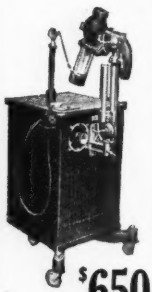
Model 530

30 M. A. Variable Gap 3 to 5"

Expressly adapted to needs of the oral surgeon, who requires films or plates of the frontal and maxillary sinuses as well as intra-oral films; or for installations where both dental and routine medical work is to be done. Fully counterbalanced tube holder. Capable of doing all radiographic work, including chest, stomach and intestinal tract. Equipped with magnetically operated exposure switch and combination cone.

Model 310

10 M. A. 3" Gap



Expressly adapted to strictly dental radiography, having the advantage of the right angle Coolidge Tube. Especially easy and rapid adjustments for intra-oral work, fully counterbalanced tube holder; the complete equipment very compact and easily moved about. Can be operated either with patient in dental chair or separate chair. Operated off ordinary light wiring.

$650

MODEL 530

$960

Both outfits are equipped with the L-F automatic time switch, which makes possible the accurate timing of all exposures, insuring uniformity of results.

The Liebel-Flarsheim Co.

416 Home St.

Cincinnati, Ohio.

The Plant Behind The Product

Manufacturers of X-Ray Apparatus for the Dentist, General Practitioner and X-Ray Specialist. Distributers for the General Electric Co., Portable Coolidge X-Ray Outfit.

The Liebel-Flarsheim Co.
Cincinnati, Ohio.

Please send me without obligation further information on Model.....

I have ... volts direct current.

I have .... volts .... cycles alternating current.

Dr. .....

City .....

State .....

Cutwell TRADE MARK Burs

for

Particular Dentists

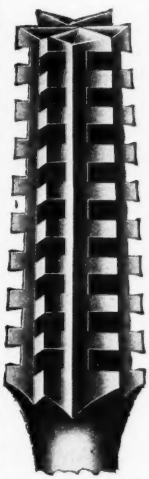
Round—Nos. ½ to 11. Notice Cutting Angle and Continuous Center Tooth.

Inverted Cone — Nos. 33½ to 40. Clean, Sharp Blades. Continuous Center Tooth.

THE STEEL from which Cutwell Burs are made has very fine grain, great density, stiffness and strength; can be machined smoothly and accurately, producing burs having regular, fine, smooth and very sharp edges, without "over-hang' or wire-edge.

Cutwell Burs take high temper but are not Brittle

Every Cutwell Bur and every leaf of every bur of any particular style or size is as nearly a duplicate of every other bur and leaf of like kind as possibly can be produced; each has the correct cutting angle; is sharp as steel can be, insuring rapid, easy cutting under delicate handling; is uniform in temper; runs true, is accurate in size; every tooth is smooth and keen, bright and free from debris.



In the lower left hand corner we present a new addition to the Cutwell bur family, that has proved itself a worthy member. In the use of the Cutwell Crosscut Tapered Fissure bur, the entire length of a cavity-wall may be dressed at a single operation, avoiding entirely the danger of making undercuts where they are not indicated.

Heads are amply long to reach the bottom of any cavity.

Dealers everywhere.

Write for Special Literature

The Ransom & Randolph Company

TOLEDO, O. U. S. A.

CLEVELAND COLUMBUS GRAND RAPIDS FLINT DETROIT

Crosscut Tapered Fissure, 700 to 703

Crosscut Fissure Nos. 557 to 562

THE BORINE MFG. CO. HAS PAID 8 PER CENT DIVIDENDS SINCE 1903

(Except two years when the building now occupied in West 42nd Street was purchased. This property has more than doubled in value.)

ALL THROUGH THE WAR WE PAID JUST THE SAME—8 PER CENT.

Conducted as a cooperative corporation composed of **dentists exclusively,** and with the same efficient management, you are assured of 8 per cent dividends. **The more working members, the larger the returns.**

18 YEARS HAVE DEMONSTRATED THE PROFESSION PROVES THE QUALITY OF BORINE.

Sign and send subscription application with your check and professional card at once and receive membership package of Borine products, consisting of Glass stoppered bottle for cabinet, Borine liquid antiseptic, Borine Powder, Boriclor Paste, Annual appointment book, prescription pads, samples and Extraction envelopes with your name and address.

Four to six times a year you receive a supply of samples as well as a liberal supply for your own office use.

Sign subscription application and send with check now and become a member of the most successful dental cooperative organization in the world.

SUBSCRIPTION APPLICATION

BORINE MFG. CO.,
551 West 42nd St., New York. Date.....

Gentlemen:

I hereby enclose $.....for.....fully paid
(No. of Shares)
and non-assessable 8% preferred shares of the capital stock of the
BORINE MANUFACTURING COMPANY
at Par, $10.00 per share.

Stock certificates to be issued in the name of.....

Signed .....

Address .....

N. D. J. .....

One or more $10.00 shares get full service. More you buy, larger your dividends. 50 shares limit.

BORINE MFG. CO.

551 West 42nd Street **New York City**

Dental Coolidge Unit

Efficient, Flexible and Durable

AN UNPRECEDENTED BARGAIN, PRICED AT A FIGURE TO INSURE SALE PRIOR TO INVENTORY. UNCONDITIONALLY GUARANTEED. ACT AT ONCE—SAVE $300.00.

X-Ray equipment is today regarded by the Dental Profession as a necessary and indispensable unit in the successful practice of the profession. No longer is it necessary to "guess" as to whether that root canal is properly taken care of or not because, with the service of an efficient machine, existing conditions may be determined with exactness.

CONSTRUCTION

Our unit consists of an all-steel cabinet, housing all parts, finished mahogany, and mounted on specially constructed, free-moving casters, with our special flexible X-Ray tube holder attached. The tube holder is so arranged that it is instantly adjustable to any desired position and is provided with a special glass tube shield, constructed of lead glass, offering thorough protection to both operator and patient. Mounted on top of the cabinet, on marble slab, so that they may be easily read, are voltmeter and milliamperemeter. Volt meter giving primary reading and milliamperemeter indicating current passing through tube. Foot contact switch is provided, leaving the hands of the operator free for timing or making fluoroscopic examination. With the equipment, and at the price quoted below, we furnish a self-rectifying Coolidge Radiator-type tube, designed with special reference to convenience of focusing in dental work.

9ND140. Betz Coolidge Dental X-Ray Unit, complete, for service on 110 volt, 60 cycles, 10 amperes, alternating current, $475.00.

(Cash, Net, FOB, Hammond, Ind.)

FRANK S. BETZ CO.

RETAIL
CHICAGO
30 E. RANDOLPH ST.

WHOLESALE AND MAIL ORDER DEP'TS.
HAMMOND, IND.

RETAIL
NEW YORK
6-8 W. 48TH ST.

From the film "Conduction and Infiltration Anesthesia."

"A Satisfied Patient is The Best Advertisement"

This "satisfied" expression was caught by the camera immediately after many roots and all remaining upper and lower teeth had been extracted.

Complete and profound anesthesia of the entire mandible and both superior maxillae was obtained by two mandibular, two infraorbital and **one** long buccal injections. Altogether, 9 cc of a 2% Novol Procaine Solution was used.

This was a carefully observed case, for this patient presented himself as a subject for part of our motion picture film, "Conduction and Infiltration Anesthesia with Novol," which is being shown at our classes in Conduction and Infiltration Anesthesia, before dental societies and at depot clinics.

This film is a part of Novol service, which provides an efficient anesthetic for every dental need and the proper technic for their use.

Put your anesthetic problems up to us.

NOVOCOL CHEMICAL MFG. CO., INC.

Makers of NOVOCOL PRODUCTS

2923 Atlantic Avenue, Brooklyn. Brooklyn, N. Y. Chicago.

Some Questions

Dentists Ask About Pepsodent

Is it alkaline?

No. It contains no soap, no chalk. It is acid in reaction, conforming with Dr. Pickerill's theory and the best modern dental opinion.

How does it produce results?

In several efficient ways. It multiplies the salivary flow and reduces its viscosity. It multiplies the ptyalin in saliva — the starch digestant — that dissolves starchy particles which cling.

Its unique polishing agent removes plaque directly. It also keeps teeth so highly polished that plaque is less apt to cling.

Pepsodent also contains pepsin.

How else does it act?

It multiplies the alkaline index of the saliva and maintains an excess long. This to neutralize the molecules of acid as they form.

Is the acid harmful?

Our technical literature — sent on request—will prove that it isn't. We have kept natural teeth immersed for four years in Pepsodent mixed with saliva.

What polishing agent?

The polishing agent is tricalcic phosphate, the chief tooth constituent. It is finely powdered and sifted through a 200-mesh.

Why so conspicuous?

The polishing agent is conspicuous because we use no soap. People are accustomed to soap lubrication.

Will it scratch enamel?

Natural teeth in our laboratory have been brushed with Pepsodent 250,000 times. It has been applied to teeth and to gold under pressure to equal years of ordinary brushing with no evidence of harm.

Learn all the facts

If you do not know Pepsodent, ask for a tube to try. With it will come all the facts and the formula.

Millions now use it. You are often asked about it. Let us tell you all the years have proved.

PAT. OFF.
Pepsodent
REG. U. S.

The Modern Dentifrice

An efficient plaque combatant which complies in all ways with the best dental opinion.

THE PEPSODENT COMPANY, 487
6308 Ludington Bldg., Chicago, Ill.

Please send me, free of charge, one regular 50c size tube of Pepsodent, also literature and formula.

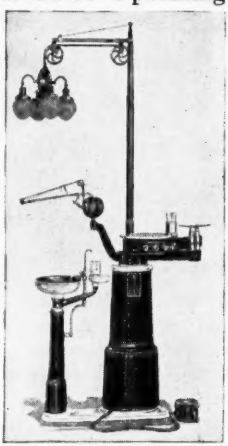
Name .....

Address .....

Enclose card or letterhead

ELECTRO DENTAL UNIT

A Complete Dental Office Operating Equipment—including:



Engine
Electro Dental Light (Rhein)
Automatic Switchboard Bracket Table
Fountain Cuspidor
Air Compressor
Set of Instruments
Hot Air Syringe
Cutoff
Water Heater
Atomizer Heater and Atomizers
X-Ray Picture Reader
Pedestals and Base

ELECTRO DENTAL UNIT—Junior

A Dental Office Operating Equipment including:

Engine, Fountain Cuspidor, Bracket and Table, Gas and Air Outlets, Bunsen Burner, Pedestals and Base.

At any time the following parts of the Senior Unit can be added to the Junior Unit:

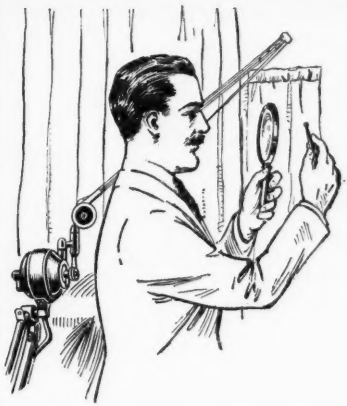
Automatic Switchboard Bracket Table (with Accessories)
Air Compressor
Electro Dental Light (Rhein)

Furnished regularly in MAHOGANY finish.

In white, gray or black enamel finish on special orders only.

For further details, consult your dealer.

ELECTRO DENTAL MANUFACTURING CO.
New York *Philadelphia* *Chicago*



Do you know the advantages of Stoned Burs?

FOR the same reason that a carpenter "stones" a plane blade, and a barber "hones" a razor, we "put an edge" on Revelation Burs after the blades are cut and hardened.

Edge tools for any purpose are sharpened to make them cut cleaner and more rapidly and to make the edge "hold" longer. With burs the same argument holds true and in addition, the comfort of the patient is a consideration. Sharp, true-running burs cut with less pressure, less heat and less pain. Less irritation to the patient means less interruption in your work. Stoned burs have every advantage as the larger bur users have proved to themselves.

The kind of steel, the method of production, the attention to details and the rigid inspection make

Revelation Burs

the best and cheapest burs to use

Your Dealer Can Supply You

THE S. S. WHITE DENTAL MFG. CO.

"Since 1844 the Standard"

PHILADELPHIA

Send for Booklet "Burs"

A Broad Gauge Operator in a Narrow Office

Dental Cabinet No. 97 is especially suitable for narrow offices but sufficiently deep so as to be well balanced, giving a pleasing effect in any office. The medicine top contains sixteen labeled bottles in a row—not one in front of any other.

AMERICAN CABINET CO.
TWO RIVERS, WISCONSIN

The illustration gives a very good idea of the distinguished aspect possessed by cabinet No. 97 when in active service at the operator's side. It is just as convenient and practical as it is appealing.

Shown on Pages 40 and 41 of the "American" catalog.

Five Separate Bins

A feature of this combination Plaster and Investment Material Bin. One large bin for ordinary plaster, smaller one for finer Impression Plaster and three small bins—one of which may be used for pumice, one for crown and bridge, and the other for inlay investment material.

No Wonder She Smiles

Patients and Dentists alike are Proud of Inlays made with

JELENKO'S

Special Inlay.
CASTING GOLD

Not only does it cast perfectly, with sharp, true margins, but it polishes so satisfactorily, from the standpoint of the patient.

Any dentist can safely entrust his reputation for Inlay Work to the sterling qualities of JELENKO'S GOLDS. It is harder than pure gold. Contains an alloy which prevents its flowing under stress.

Jelenko's Special Inlay Casting Gold, per dwt.....$1.20

OTHER JELENKO CASTING GOLDS ARE

Jelenko's 18 and 20 Kt. Casting Golds for plate, bridge and saddle work. Dense, non-porous, **light yellow** in color. Remarkable tensile strength.

18 Kt. Casting Gold, per dwt.....$1.00
20 Kt. Casting Gold, per dwt.....$1.10

Jelenko's No. 5 Casting Clasp Gold, for strong, springy clasps, finished in platinum color. Contains high percentage of Platinum and Palladium. Fusing point, 1950° F.

Price, per dwt.....$2.50

Jelenko's No. 6 Casting Clasp Gold, for clasps, just as strong and springy as made with No. 5, but finished in GOLD color. Contains 5% platinum. Fusing point, 1760° F.

Price, per dwt.....$1.65

If you believe in specialized products for special needs, you will become a user of **Jelenko's Golds.**

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CORRECT DIAGNOSIS

The most important step in successful Dental Practice

YOUR diagnosis must be not only correct, but must be made so easily and surely as to instil confidence in the patient's mind. You want modern apparatus that will enable you to do this.

With Cameron's Dentalamp you can make accurate diagnosis of root end infections! The searchlight rays readily transilluminate all dental process. Healthy dental condition is indicated by pink transparency; abscessed teeth are shown up by well defined shadows.

Cameron's Dentalamp is now in daily use by more than 20,000 Dentists and Oral Surgeons. With this equipment there is no guess work—every diagnosis is immediate and positive. And there is no other mouth lamp that is both clean and cool! With every set is included our treatise on "Diagnosis by Transillumination."

We will gladly send you this equipment on 10 days' trial. Then, if not satisfactory, we will take it back without cost to you. Mail the Coupon Today.

Tear off here!

American Surgical Specialty Co., 6 E. Lake St., CHICAGO.

SEND me, on 10 days' trial, one Cameron's Dentalamp (Cool X-Raylite Model), including 110-Volt Potential Reductor Unit, which operates on either direct or alternating current, 8 feet of silk covered cord with necessary connections, two Straight Dentalamps, two Right Angle Dentalamps, two Detachable Mirrors, all in velvet lined Fabrikoid carrying case, with one copy of "Diagnosis by Transillumination," for only $30.00.

If not entirely satisfactory to me, I may return the above within 10 days at your expense, and you agree to refund all money immediately.

Check enclosed for $30.....☐ Send outfit C. O. D.....☐

Name .....
Address .....
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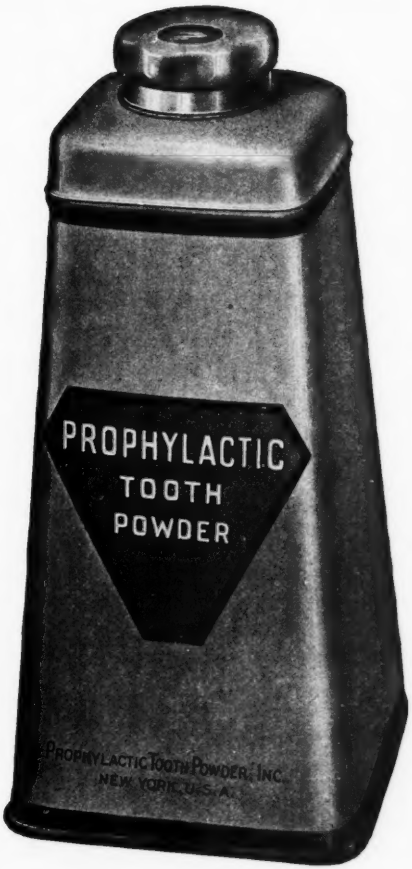
220 Volt Standard Socket Type.....$35
For Delco or similar system.....$35

For "Bayonet Socket" type:
110 Volts.....$35 220 Volts.....$40

PROPHYLACTIC TOOTH POWDER

Prophylactic Tooth Powder will thoroughly cleanse natural teeth and disclose the natural beauty and polish of uncoated enamel. Likewise it will render artificial dentures, and regulating appliances as clean and polished as when leaving the laboratory.



ETHICAL

Its ingredients are open to public inspection.

SCIENTIFIC

Because its production is the result of 37 years of continuous research in the field of preventive dentistry by Dr. M. L. Rhein.

EFFECTIVE

Because its action is due to a mixture of organic salts with alkaline agents, producing an impalpable powder, in which acid activity immediately removes the Mucin Placque. This acidity is quickly neutralized and replaced by an alkaline reaction so quickly that all danger of decalcification of the enamel is avoided.

This can be tested by mixing the powder with water and inserting a piece of blue litmus paper, which will at once turn pink. This color will immediately begin to fade and soon return to a deep blue color.

We use no salesmen. See that your druggist keeps it in stock.

SAMPLES

Samples will not be indiscriminately distributed, but any reputable dentist may have one by making request by mail.

Price: Per dozen, $6; per gross, $66.
Single Can, 75c.
To any address in the United States.

Patented, United States, March 15th, 1919.

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PROPHYLACTIC TOOTH POWDER, INC.

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Successful Anesthesia

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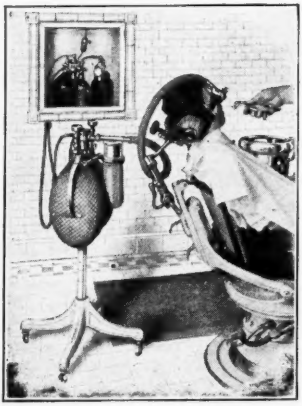
McKesson Equipment

The progress in Dental Surgery and your practice in particular requires elimination of those occasional failures to relieve pain and the frequent occurrence of excessive after-soreness—*Both avoidable.*



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AUTOMATIC

EFFICIENT *and*

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Toledo Technical Appliance Co.

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Conducto

PROCAIN-SUPRARENIN RINGER TABLETS

(Formula and Method of Arthur E. Smith, D. D. S., M. D.)

Two Formulas

Regular

Procain (Novocain)	.02000	Gramme
Suprarenin Synthetic	.00004	"
Sodium Chlorid	.00500	"
Calcium Chlorid	.00040	"
Potassium Chlorid	.00020	"

One tablet added to 1 mil (1 c. c.) of sterile distilled water will prepare a solution containing 2% Procain, 1/250% Suprarenin and at the same time a fresh Ringer solution which is physiologically isotonic.

Special

Procain (Novocain)	.02000	Gramme
Suprarenin Synthetic	.00002	"
Sodium Chlorid	.00500	"
Calcium Chlorid	.00040	"
Potassium Chlorid	.00020	"

One tablet added to mil (1 c. c.) of sterile distilled water will prepare a solution containing 2% Procain, 1/500% Suprarenin and at the same time a fresh Ringer solution which is physiologically isotonic.

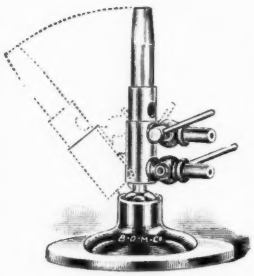
Conducto "Special" tablets are offered to those of the profession who desire to use an anesthetic solution containing a lesser amount of Suprarenin. With the exception of the quantity of Suprarenin used (.00002 Gramme instead of .00004 Gramme) the formula is identical with the regular Conducto tablets and the same directions are followed in the preparation of the anesthetic.

Eliminates the Use of Undesirable Stock Ringer Solution

DENTAL PRODUCTS COMPANY

623 So. Wabash Ave. - - Chicago

For Extra Fine Soldering



such as the making and fitting of special regulating appliances requires; for soldering crown and bridge-work; in fact, for small soldering of any description where the finest kind of needle flame is required, we suggest that you try a Buffalo Dental No. 5½ Orthodontia Burner.

We will back your Dental Dealer in letting you have one of these burners on trial, because we are positive a burglar could not get it away from you after you had used it once.

You'll swear by it -- (not at it)

It can be used as a Bunsen as well as a Blowpipe, can be tilted at any angle; having a ball and socket joint, and will produce a small brush flame which can be turned down to a point so small that it is hardly distinguishable.

Small, compact, made of brass and beautifully nickel plated.

Ask for further particulars concerning Young's Orthodontia Soldering Burner.

BUFFALO DENTAL MFG., CO.

BUFFALO, N. Y., U. S. A.

MAKERS OF THE LEWIS CROSS BAR VULCANIZERS

"Special Light Pink"

A NEW Veneering rubber of a "healthy" light gum tint, with the same high percentage of pure rubber content as our deeper pink veneers.

This means strength and density combined with a very desirable color and a veneering rubber that takes a fine, permanent polish.

Although this is the first public announcement of the new pink rubber it is not an experiment. Like our other improved rubbers it is offered to the profession only after an accumulation of unassailable proof of its worthy character.

S. S. White Improved Dental Rubbers are "improved" rubbers; the realization of this fact is resulting in a wonderful demand for them; the demand will extend to

S. S. White Special Light Pink Veneer

In half-pound boxes

Per pound $5.00

Attractive quantity rates

Ask your Dealer for it

"A booklet free on request.
"Better Dental Rubbers and How to Use them"

The S. S. WHITE DENTAL MFG. CO.

"Since 1844 the Standard"

PHILADELPHIA

It is very generally known that normal saliva is alkaline and that where acid conditions of the mouth are found, they exist generally because fermenting food about the teeth produces more acid than the saliva can neutralize.

is unusually effective in correcting acidity of the mouth, it bubbles its way between the teeth, cleans out crevices destroying germs and their products, checks fermentation and stimulates the flow of saliva.

Dioxogen helps to restore neutral and healthy conditions in the mouth.

THE OAKLAND CHEMICAL CO.

59 Fourth Avenue **New York, N. Y.**

NOVOCAIN

(Procaine-Metz)

And Other Local Anesthetics Admitted to the Mails

Novocain and Novocain Tablets can now be transmitted by mail.

We can supply Novocain-Suprarenin (N-S) Tablets "E", "H", and "T", Novocain-Suprarenin (N-S) Pluglets, and Novocain Tablets "F", representing various strengths for various usages, in all conditions in which local anesthesia is indicated.

We also suggest the use of Novocain powder, as well as Parathesin (Anaesthesin) for anesthesia of broken surfaces, Pyramidon, analgesic and anodyne, and Ringer Tablets.

If unobtainable from your druggist order directly from

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Whether you subscribe for one or a dozen dental journals, if you are not a regular reader of the Dental Cosmos you are missing many of the most notable contributions to present-day dental literature.

The Dental Cosmos ranks easily with the most authoritative of text books, with the added advantage of being constantly up-to-date. Not alone devoted to the discussion of theoretical problems, it has an intensely practical value in the reports and suggestions applying to the daily work of the dentist.

Take one department alone,—"Practical Hints,"—and under this heading in the first ten issues of 1920 have appeared 31 valuable suggestions, any one of which alone is worth the price of a year's subscription, in solving the daily problems arising in practice.

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PRECIOUS METALS
FOR THE DENTAL PROFESSION

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18 K, 20 K	For full and partial Dentures
22 K, 24 K	For Inlays
24 K	containing 3% Platinum
24 K	containing 5% Platinum
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Experience has demonstrated that gold filling is the best means of saving teeth.

The American dentist is not slow to appreciate excellence, and is willing to pay a fair price for an article that has merit.

ROWAN'S DECIMAL FILLING GOLDS POSSESS MERIT.

The soft gold foil worker who desires the best, will find nothing to equal

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Ask your dealer for these Golds, or write to us direct.

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TEN ESSENTIALS

Involved in the successful application of the PORCELAIN JACKET CROWN.

Preparation of the Tooth.
Vital Tooth Preparations.
Importance of the Shoulder.
Pulpless Tooth Preparation.
Taking the Impression.
Color of Teeth.
Taking the Bite.
Protection of the Prepared Tooth.
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All of these essentials and much practical Laboratory Experience, are thoroughly discussed and illustrated in our book CERAMIC DENTISTRY.

This treatise may be obtained from us without charge.

The Lochhead Laboratories, Inc.

Specialists in Ceramic Dentistry
25 East Washington Street,
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The Original Claims for Lilly's Dental Paste Need No Modification

Extract From The Journal of Dental Research December, 1919

"From what has been seen, in these contrasts between falsities and facts, it is manifestly time for members of the medical and dental professions to be on their guard, and to caution their patients against placing reliance on misleading statements * * * * * * . Patients should be made to understand that tooth pastes and tooth powders serve an important purpose as cleansing agents, but they do not possess the germicidal or curative properties frequently claimed for them. The physician or dentist who fails to differentiate between dentifrices that are truthfully described by their manufacturers, and those for which extravagant or untruthful claims are made, is lax in his duty to the public and to his profession."

Statement Used On Lilly's Dental Paste Since 1910

It should be remembered in the use of a dentifrice or mouth wash that, strictly speaking, the mouth cannot be sterilized by the employment of disinfectants. Any agent of which we possess knowledge at the present time, used in such strength as to kill germs in the mouth, would act deleteriously upon the mucous membrane. It becomes necessary, therefore, to dispose of these germs by other means. This Dental Paste is an antiseptic in that it will check the growth and activity of the germs found in the mouth, and its detergent property will, by the use of the toothbrush, remove them from their field of activity, thus leaving the mouth clean.

Lilly's Dental Paste meets all requirements for cleaning teeth and gums —no other claims have ever been made for it.

Supplied by the Trade in 2 and 4-ounce tubes

—MADE BY—

ELI LILLY & COMPANY

INDIANAPOLIS, U. S. A.

Have you an open tube X-ray in your office?

Electrocuted

Was Dr. C. L. Cope, Seymour Dentist, While Operating X-Ray Machine.

TAKING PICTURE OF TOOTH.

Dr. C. L. Cope, a prominent young dentist, was instantly killed this afternoon while working with an X-Ray machine at his office in the Laupus building on Chestnut street. He was electrocuted when about forty thousand volts of electricity passed through his body.

This unfortunate man came in contact with the radiator end of the tube. Were he operating a THWAITES UNIT such an accident would have been an impossibility—due to the fact that ALL high tension leads and terminals are enclosed in a thoroughly electrically insulated cabinet.

Shock Proof
Burn Proof
Fool Proof

If you desire to operate a unit that is totally free from superfluous controls and switches, write us. We offer a service that renders our installations productive.

Thwaites X-RAY CO.

GRAND RAPIDS
MICHIGAN
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MANHATTAN

ASSISTANT'S DRESSES

Have the same snap and style that characterizes all MANHATTAN Garments. Garments that really fit, have the proper hang and just-rightness, and always hold their shape and appearance. They will more than please you.

MANHATTAN DRESSES ARE PRESHRUNK

and will not shrink in laundering, thus assuring a satisfactory fit.

The workmanship is of the best. Made by experts with careful attention to every detail. We guarantee satisfaction. Why not order today.

Made of extra quality linen-finish Indian Head, at only:

$4.50 each or 3 for $12

[Order by size (34 to 46)]

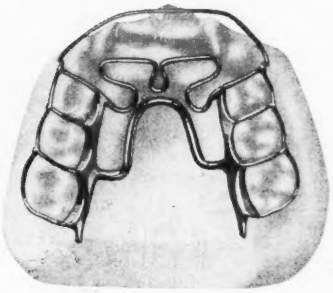
These garments are exceptional values, as the price has been reduced from $6.00 each.
We can also furnish these garments in a variety of materials and styles and will be glad to send samples and literature on request.

Manhattan Coat Factory, Inc.

Dept. N. 3223 N. Halsted St., Chicago

DOCTOR: Send for samples of our special offer on KERSEY CLOTH. Coats made in the popular MANHATTAN style, at 3 for $10. The biggest coat value your money can buy!

Successful Regulation of Stubborn Malocclusions



DR. BACON'S Removable Regulating Appliance has made an enviable record for remedying the most difficult cases of malocclusions. Because this appliance is anchored to every posterior tooth with the positive can't hook grip while it exerts an even steady pressure which conforms the teeth to the ideal arch form, it opens the suture between the superior maxilla, enlarging the nasal passages and releasing the sphenoid bone and encourages development at the base of the brain.

The result to be expected, perfect occlusion and increased general health due to the improved conditions in the nasal passages, and a decrease in nose and throat infections, have invariably resulted from the proper use of this appliance.

THE BACON MFG. CO.

DR. D. S. BACON, Pres.

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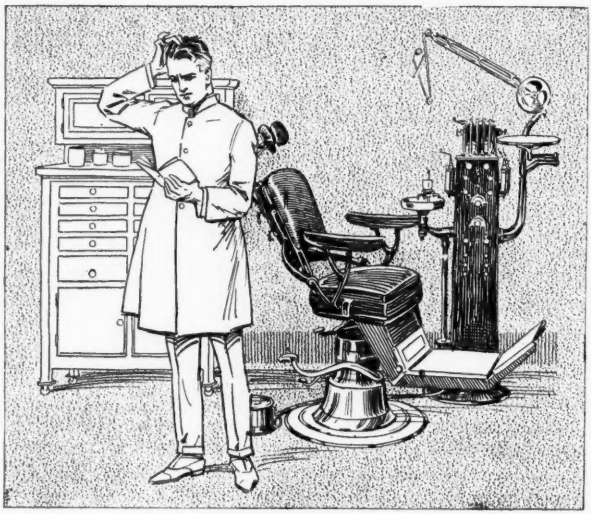
Price
Gold wire $20
Platinum Gold $40

Terms
Cash with order or C. O. D.

This picture represents the hit and miss Dentist who is keen to improve his professional technic but neglects the business side, feeling that on account of his doing his work so well, the fees would take care of themselves and when the year is over, he doesn't know what has happened except he knows there is not enough to care for his needs, let alone comforts, pleasure and the future.



The Bosworth Efficiency System will relieve you of these worries and makes it possible to end up the year with a surplus for all needs. Price, complete system, $118.00.

SPECIAL OFFER

In order to prove up the increased earning possibility, we will for $20.00 send you the part of the System that increases earnings, feeling that when the improvement takes place, you will want the entire System. Write for the names of Dentists who are using this System.

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This is the style of operating gown recommended by Mr. Bosworth for the dentist and office assistant.

When dressed in this manner you impress the public favorably. You save your street clothes, as they are removed before gowns are put on. The psychology is good and it's good practice.

Send for Booklet on Office Assistant's Duties.

DeLuxe Dentists Gowns.....$6.50
DeLuxe Assistants Gowns..$5.50
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Send height, chest and sleeve measurements.

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Effective In Treating Putrescent Pulp

HYCLORITE has a positive antiseptic action in oral infections such as putrescent pulp. It dissolves pus and necrosed tissue, is a potent germicide, an excellent deodorant and, because of its low alkalinity, is absolutely non-irritating to normal tissue.

Hyclorite is easily and quickly diluted to the required strength; is economical because effective in dilution as high as 1-2000; and, unlike other hypochlorites, has such remarkable keeping qualities that it can be stored in quantities and kept ready for any emergency.

Accepted by Council of Pharmacy and Chemistry of the A. M. A. (N. N. R.)

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Manufactured by
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NERVE BLOCKING IS NOT DIFFICULT

Think what it will mean to your patients—abscessed teeth extracted, sockets curetted—pulps removed—cavities prepared—**Without a suggestion of pain.**

YOU HAVE THE ABILITY

to do this work. Let us teach you from Dr. Waite's book of instructions and thirty photographs and illustrated charts, which is **free with our $11.00 Nerve Blocking Outfit.** We have started thousands of dentists doing Nerve Blocking with Dr. Waite's book, illustrations and outfit.

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LOCAL ANAESTHETIC
WITH PROCAINE "NOVOCAINE"

It is a Sterile—Isotonic—Antiseptic Solution—Requires No Boiling—Always ready for use.

You certainly had to first try the anaesthetic you are now using. You owe it to yourself and patients to try a sample of Dr. Waite's wonderful anaesthetic.

CUT ON THIS LINE

TO YOUR DENTAL DEPOT:

Please send me Dr. Waite's $11.00 Nerve Blocking Outfit consisting of Anaesthetic, Applicators, large bottle Antiseptic Solution with all metal / glass barrel syringe, needles for doing this work and include free Dr. Waite's Book on Nerve Blocking with 28 photographs.

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FREE-- SAMPLE BOX 2½CC AMPULES, --FREE

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Please mail me a sample box of Dr. R. B. Waite's Local Anaesthetic with Procaine for Infiltration or Nerve Blocking.

Name .....

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Please give name of anaesthetic you are now using—it will be greatly appreciated.

I am now using .....

Keeps Partial Plates Firm After Extractions

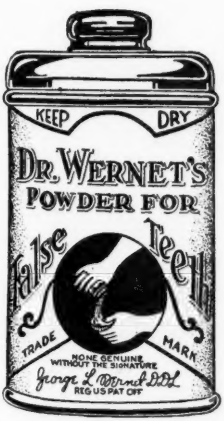
PATIENTS wearing partial plates who have had extractions made preparatory to the fitting of a new denture, will welcome the comfort made possible by sprinkling the partial plate with Dr. Wernet's Powder (White).

Dr. Wernet's Powder (White) will keep the partial plate in place until the new denture is finished.

Dentists attending the National Dental Convention held in Boston, who learned of this use for Dr. Wernet's Powder (White) more than welcomed the suggestion.

When you have work to do on patients wearing partial plates, use Dr. Wernet's Powder (White) to make the old plate adhere until new one is ready.

Put Dr. Wernet's Powder (White) to a strict comparative test for color, taste, odor and adhesive qualities and you too will credit it with superiority in every particular.



Dentists are Using Dr. Wernet's Powder (White)

To eliminate bite plate troubles when trying out for lines of expression and making face bow measurements.

To keep wax trial plates in place.

To prevent cotton rolls from sliding and slipping.

On old plates after changes have been made in them.

On new plates which, due to the insistence of the patients, have to be fitted several days after extractions.

On temporary plates.

On plates for flabby ridges.

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116 Beekman Street **New York, N. Y.**

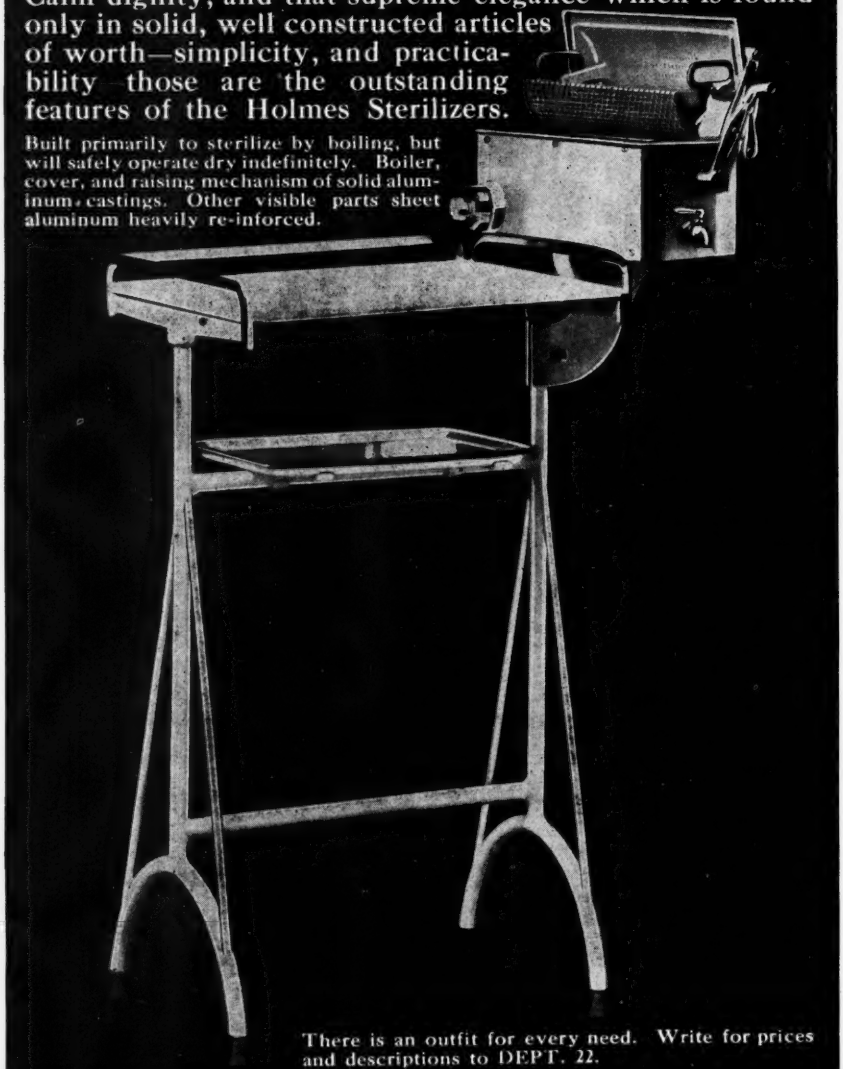
Sold by Drug Stores, Department Stores and Dental Supply Houses

THE HOLMES STERILIZER

A Marvel of Simplicity

Calm dignity, and that supreme elegance which is found only in solid, well constructed articles of worth—simplicity, and practicability those are the outstanding features of the Holmes Sterilizers.

Built primarily to sterilize by boiling, but will safely operate dry indefinitely. Boiler, cover, and raising mechanism of solid aluminum castings. Other visible parts sheet aluminum heavily re-inforced.



There is an outfit for every need. Write for prices and descriptions to DEPT. 22.

M. F. PATTERSON DENTAL SUPPLY CO.

Box 1100 ST. PAUL, MINN.

Synthay Sylikay!

A Master Silicate

Developed and perfected by
N. K. GARHART,
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No Royalties to Pay!
80% More Powder!
100% More Liquid!

A MASTER in proven QUALITY!

A LARGE reduction in PRICE!

We point with pride to its REMARKABLE selling record!

14 Standardized Colors

Single color complete package.....$ 3.50
6-color complete package..... 15.00

Write for Special Booklet "S" on Silicate Cement

MEDIUM

60% Silver

P. M.

"Past Masters" in compounding "Plastic Materials" from "Pure Materials." These products, "made by N. K. Garhart, himself," are remarkable for their TOOTH CONSERVING value.

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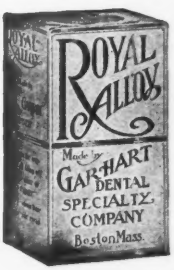

67% Silver

Prices:

5 ozs...$12.00	**10 ozs...$22.00**	**25 ozs...$50.00**
Cash... 11.40	**Cash 21.00**	**Cash 47.50**

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Catalog Mailed Upon Request

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Hill Bldg., Somerville 42, Mass.

The hole in the pocket

HOW a man hates a hole in his pocket! He doesn't stand for it long after he has found it. But he usually finds it by losing something. That's the rub.

The expense account of conducting your practice has a pocket. Perhaps it has a hole in it. Perhaps the force of habit keeps you from finding it.

If you are buying Smith's Copper Cement a box at a time, you have a hole in the pocket of your expense account.

For, when you will have bought six boxes, a box at a time, you buy one which you would not otherwise have to buy.

Just have a look at the Six Color Box of Smith's Copper Cement, retailing at $10.00.

It contains six big bottles each of powder and liquid, which, if purchased separately, would cost you $12.00.

The difference represents a saving of 20% on your investment.

And the big box contains a bone spatula which is offered as an extra inducement, if any extra inducement is needed.

You are using Smith's Copper Cement day in and day out.

It is the ideal cement for setting crowns, bridges and inlays, as well as for general fillings.

The eight shades in which it is made may be assorted in any way you wish.

Lee S. Smith & Son Manufacturing Co., Pittsburgh, U. S. A.

—and the moral

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How Pride Impels Quality

There's a gratifying sensation in the pride that emanates from real accomplishment through diligent effort.

It requires more than routine manufacturing methods that inspire an organization to promote a spirit of progressiveness—in the true sense of the word. It is a self-assumed obligation to advance all existing standards for the benefit of all.

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With this spirit dominating a well-balanced organization, it is a safe conclusion that your investment in Victor apparatus is a sound one.

VICTOR X-RAY CORPORATION

Dental Department

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OPERATIVE DENTISTRY - WARD

New (5th) Edition

Entirely rewritten, practically a new book. Changes in certain departments are little less than revolutionary. Preventive dentistry is demanded today and the new practice is fully covered in this work, as are the advances in roentgenology, local anesthesia, caries prevention, etc.

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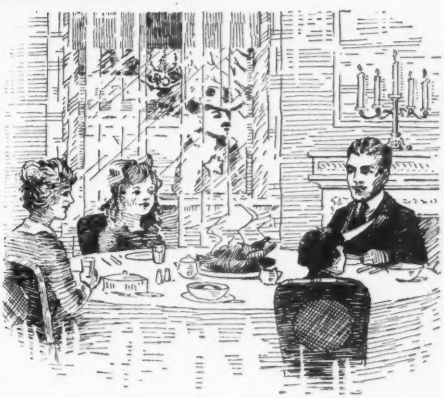

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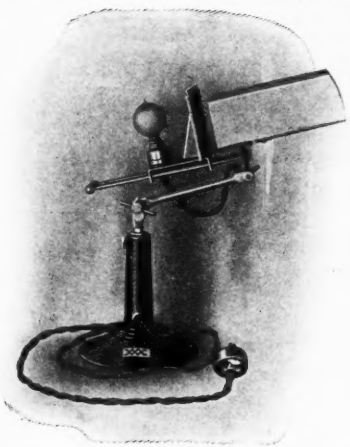

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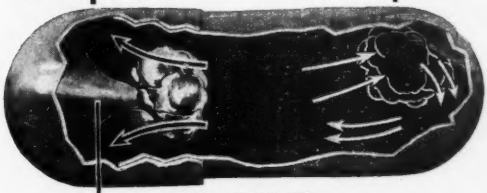

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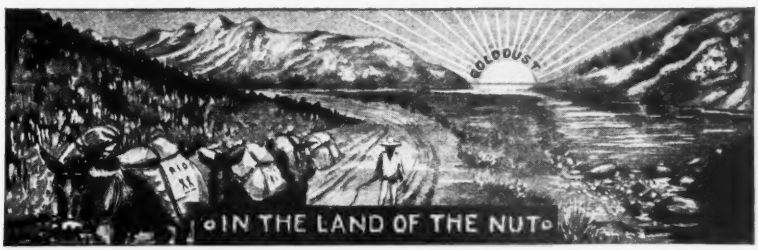

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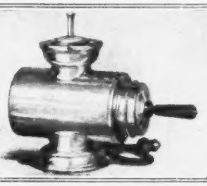

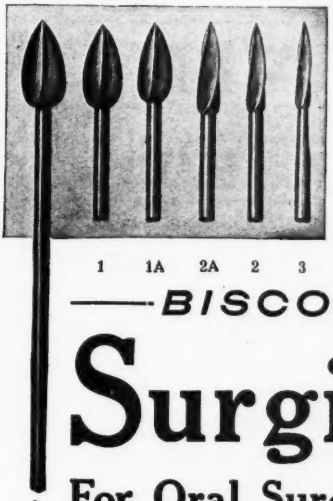

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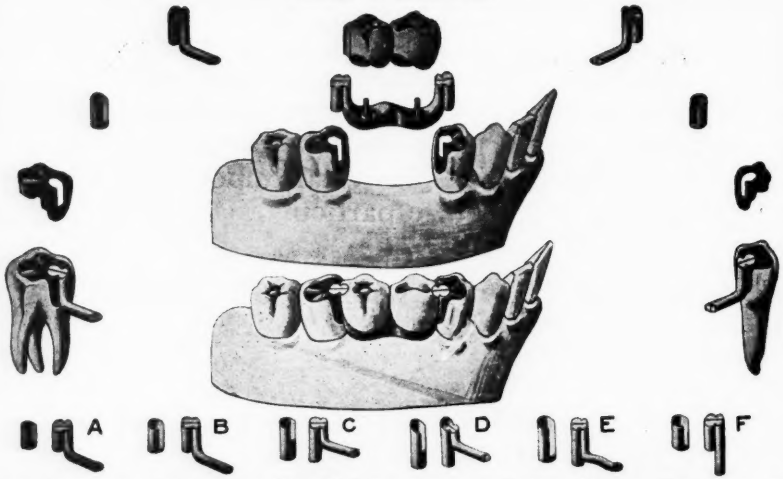

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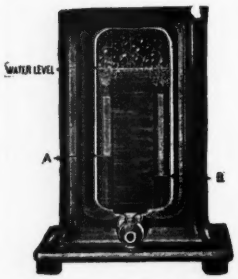

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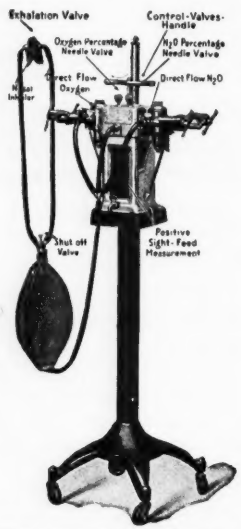

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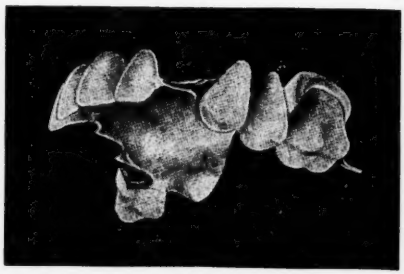

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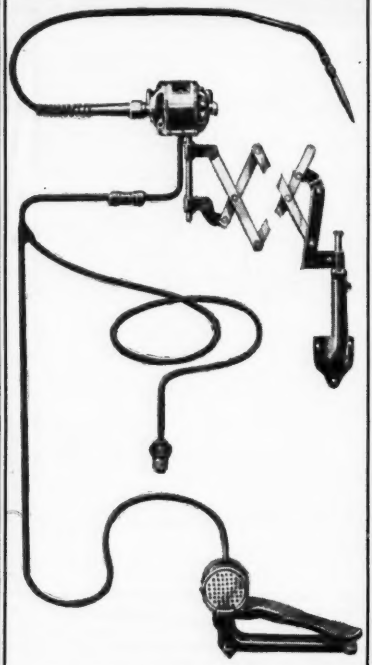

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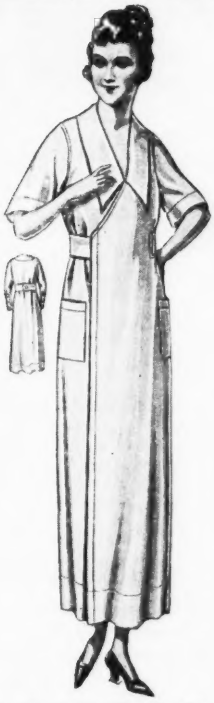

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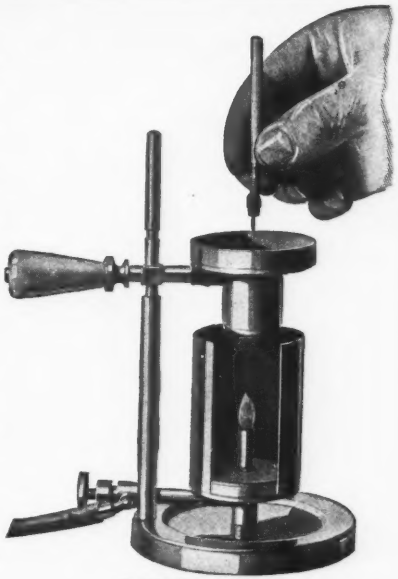

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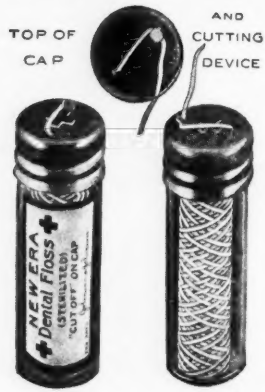

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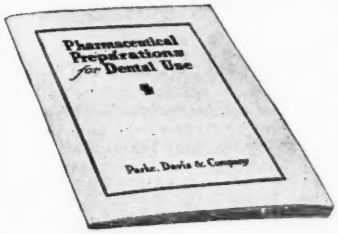

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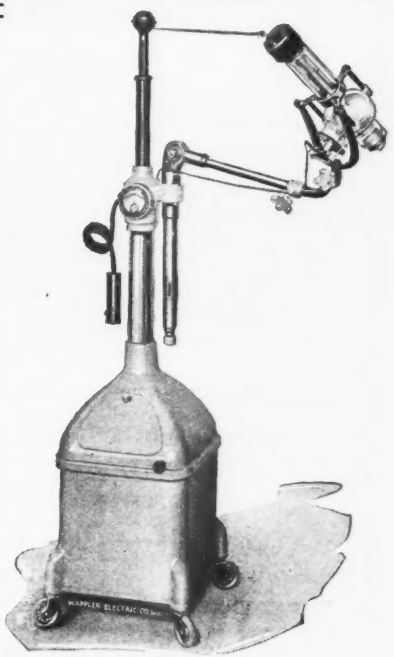
Write today for Bulletin 86, and give name of dealer to whom you wish to give preference.



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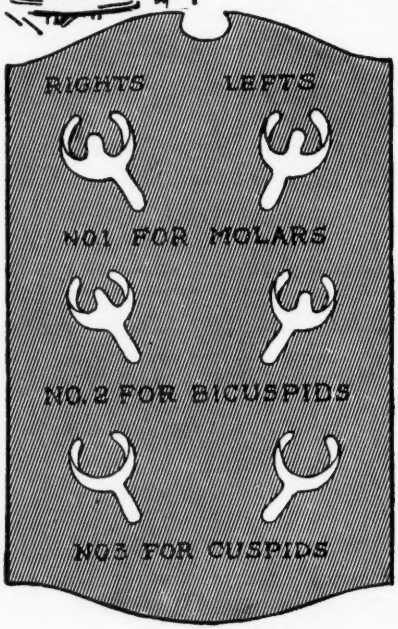

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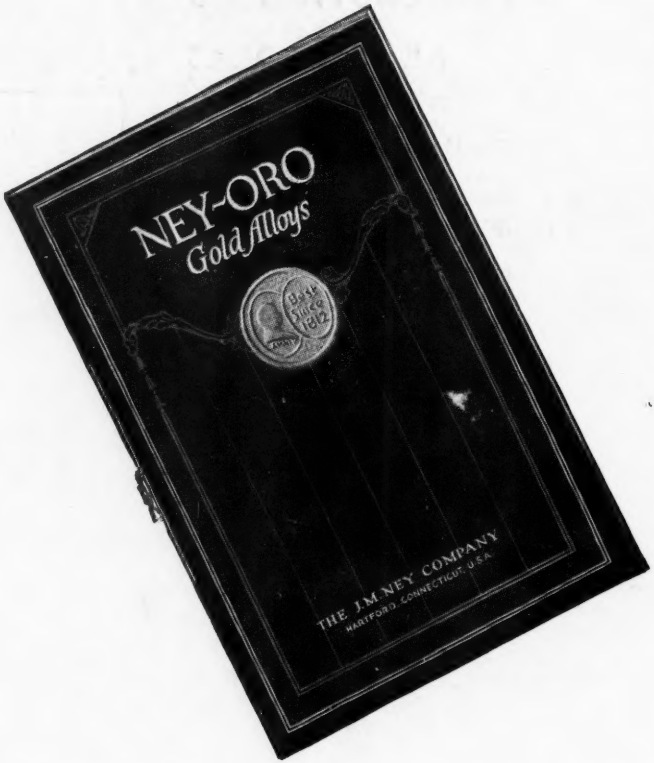

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